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DICTIONARY

OF

PRACTICAL MEDICINE:

COMPRISING

GENERAL PATHOLOGY,

THE NATURE AND TREATMENT OF DISEASES,

MORBID STRUCTURES,

AND THE DISORDERS ESPECIALLY INCIDENTAL TO CLIMATES, TO THE SEX,
AND TO THE DIFFERENT EPOCHS OF LIFE;

WITH

Numerous Prescriptions for the Medicines recommended,

A CLASSIFICATION OF DISEASES ACCORDING TO PATHOLOGICAL PRINCIPLES,

A COPIOUS BIBLIOGRAPHY, WITH REFERENCES;

AND

AN APPENDIX OF APPROVED FORMULÆ,

THE WHOLE FORMING A LIBRARY OF PATHOLOGY AND PRACTICAL MEDICINE, AND A
DIGEST OF MEDICAL LITERATURE.

BY

JAMES COPLAND, M.D. F.R.S.

FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS;
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[illegible]
[illegible]
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IN THREE VOLUMES.

VOL. I.

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JAMES COPLAND, M.D. F.R.S.

FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS;
CONSULTING PHYSICIAN TO QUEEN CHARLOTTE'S LYING-IN HOSPITAL;
CONSULTING, AND LATE SENIOR, PHYSICIAN TO THE ROYAL INFIRMARY FOR DISEASES
OF CHILDREN;
FORMERLY SENIOR PHYSICIAN TO THE SOUTH LONDON DISPENSARY;
FELLOW OF THE ROYAL MEDICAL AND CHIRURGICAL SOCIETIES OF LONDON AND BERLIN,
AND OF THE ROYAL ACADEMY OF MEDICINE OF BELGIUM, ETC.

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A
DICTIONARY
OF
PRACTICAL MEDICINE.

ABDOMEN. Syn. *Ventre,* Fr. *Unterleib, Bauch,* Ger. *Ventre, Pancia,* Ital. *Belly,* Eng. External Examination of the Abdomen in Disease.

Classification.—Pathology. *Semeiology, or Symptomatology ; Diagnosis.*

1. The abdomen may be considered as the fundamental part of the frame, inasmuch as it is never wanting in monstrous fœtuses; and as it contains parts which are the first formed in the embryo, and are the centres and sources of organic life. The number and importance of the viscera contained in its cavity; the number, the diversity, the extreme frequency and complication, of the maladies to which these viscera are liable, are circumstances which pressingly urge upon the practitioner a careful examination of the parietes of this cavity, in order to ascertain the nature and extent of disease. Much, however, will depend upon the manner in which the examination is made, in respect both of acquiring information as to the existing state of disease, and of drawing inferences as to its origin, and the best means of removing it.

2. Pathologists have generally divided the abdomen into certain *Regions,* with the view of describing with more accuracy the seat of morbid actions. These regions are marked out by means of imaginary lines, drawn in horizontal and vertical directions. The horizontal lines, four in number, divide this cavity into three zones. The highest of these lines pass over the xiphoid cartilage; the second, by the margin of the tenth rib; the third, by the anterior and superior spine of the ilia; and the fourth, by the superior margin of the pubis: thus giving three zones, the epigastric, the umbilical, and the hypogastric.

3. For the sake of additional precision, each of these zones is divided into segments by vertical lines, also four in number, drawn from the acromial extremity of the right and left clavicles to the insertion of the ligaments of Poupart; and from the posterior margins of the axillæ, over the most exterior part of the crests of the ilia, to the large trochanters. The spinous processes of the vertebræ may likewise be considered as forming a fifth line of demarcation; as we cannot overlook the posterior parts of the body in our investigation of many of the diseases affecting the abdominal organs. The vertical lines now enumerated, dividing the horizontal lines very nearly at right angles, give us nine regions on the anterior and lateral aspects of the abdomen, and six posterior regions. The *anterior* regions are the epigastric, umbilical, hypogastric, and right and left inguinal; the *lateral* regions are the right and left hypochondriac, and right and left iliac; the *dorsal* regions are the inferior dorsal—right and left, the right and left lumbar, and the right and left gluteal regions.

4. It does not belong to the scope of this work to enumerate the anatomical boundaries of the abdomen; the parts forming its parietes; or the viscera contained in each region. These are matters which are, or ought to be, familiar to all who peruse this work. But it is necessary to remind the reader, that organs which, in the healthy state, are always situate in a particular region, will be so changed in form and bulk by disease as frequently to extend to adjoining regions, where they will often be detected upon a careful examination; or they will be altogether displaced, either by the specific gravity of their contents, or by tumours developed in their structure. The former phenomenon is often remarked in respect of the liver, spleen, kidneys, ovarium, uterus, &c.; the latter, in the stomach, pylorus, gall-bladder, colon, &c.

5. This change of the position of the abdominal viscera is chiefly observed in the more chronic kinds of organic diseases, and is pointed out in the articles in which they are described: it is generally more manifest in one posture of the body than in others; and is to be ascertained, with the other maladies to which these viscera are liable, by the modes of examining the abdomen about to be explained, assisted by other rational or inferential symptoms. These modes may be made the source of much information as to all the relations of abdominal diseases; but attention, repeated observations, and much natural discernment, are required to obtain from them all the knowledge they are capable of conveying. I shall discuse this subject in the brief manner to which I am necessarily driven, by noticing, I., *Inspection;* II., *Manual examination;* III., *Percussion;* and, IV., *Auscultation* of the abdomen.

6. I. Inspection by the sense of sight merely, although the best mode of acquiring an idea of the form, size, and motions of the abdomen, is chiefly valuable as a means of investigating the diseases of its viscera in conjunction with the other modes just enumerated; yet simple inspection furnishes us with the most important information in many diseases, particularly in those of infancy and childhood, as well as in many acute and chronic maladies occurring in adults. The *form* of the abdomen, although necessarily in some measure

changed by marked variation of its bulk, may, nevertheless, be much altered without any decided difference in its size. Thus, it is somewhat changed in severe diseases of the respiratory passages, when the entrance of air into the lungs is obstructed; the epigastrium and hypochondria being then pressed inwards and upwards: whilst in some morbid states of the liver and gall-bladder, of the spleen, and of the ovaria, an unusual prominence in their respective regions is frequently observed. But the most remarkable changes in the form of the abdomen is met with when the *size* of the cavity is also altered. It is scarcely necessary to allude to examples; but, in all those diseases attended with enlargement or diminution of the bulk of this important part of the body, either in one of its regions, in several of them, or in all, inspection should always be performed: it gives greater precision to manual examination; enables us to compare the bulk of a region with the corresponding region on the other side, and with others in its vicinity; and impresses upon the memory the changes which the part may experience during the progress of disease. It should, therefore, never be neglected in all the forms of abdominal dropsy; in peritonitis, chronic or acute; in inflammation of the stomach, liver, spleen, and bowels; in the different kinds of colic, in fevers, in uterine and ovarian diseases; in affections of the kidneys and urinary organs; in all disorders accompanied with obstruction to the excretions; and, in short, in all chronic maladies. It ought never to be overlooked in the diseases of infancy and childhood, of whatever nature they may be.

7. Besides, however, attending in those diseases to the form and size of the abdomen merely, the motions which it presents ought not to be neglected. When rightly interpreted, they often furnish important diagnostic and therapeutic hints. But they require to be viewed in connection with the motions of the thorax, and state of the heart's action. In diaphragmitis, peritonitis, gastritis, enteritis, and certain states of hepatitis, the motions of the abdomen are slight or obscure, whilst the actions of the thorax are increased. On the other hand, in several severe diseases of the respiratory organs, particularly in croup, laryngitis, bronchitis, several varieties of asthma, pleuritis, pneumonia, &c., the parietes of the chest are nearly motionless; whilst the movements of the abdomen, especially at the epigastrium, in croup and asthma, are remarkably increased, or laborious. The motions of the abdomen, also, are often not limited to those caused by respiration; but in some cases, particularly in organic changes of the heart, pericardium, aorta, &c., and even in certain nervous disorders implicating these organs, comprises those occasioned by the action of the heart, increased by the state of the large abdominal vessels, and by the emaciation or other morbid condition of the patient.

8. II. Manual examination of the abdomen is one of the most important means of diagnosis we possess: but it furnishes information in proportion to the perfection of manner in which it is made. In this very requisite mode of investigation, the temperature of the hand of the practitioner at the time of making it should be attended to, in the great majority of diseases; both as a moderate warmth of the hand is necessary to the greatest delicacy and accuracy of touch, and as its application to the surface of the abdomen will not in that state occasion any disturbance or contraction of the muscular parietes. In entering upon the examination, care should be taken not to excite the alarm of the patient. The hand ought to be applied at first in the gentlest manner possible. By observing this three very important objects will be best obtained; namely, a knowledge of the form, of the temperature, and of the sensibility of the surface of the abdomen.

9. As much more information than this is required from manual examination, the patient should be directed to place himself in a favourable position for a more general and complete investigation. He should be placed on his back, with the head and shoulders slightly and comfortably elevated, and the thighs drawn nearly to a right angle with the trunk. If the bladder be full, it should be emptied. When proceeding to examine, the patient should be told to relax all the muscles, particularly the abdominal muscles. Commencing, therefore, with the utmost gentleness, and passing the hand slightly over the abdomen, we should slowly increase the pressure, with the view of ascertaining the following conditions: — 1st, Its temperature; 2d, Its form and size; 3d, Its sensibility; 4th, Its degree of tension and firmness; 5th, The existence of enlargements, tumours, &c.; 6th, The presence of effused fluids; 7th, The probable existence of accumulated secretions and fæcal matters; 8th, Hernial protrusions and displacements. On each of these I proceed to offer a few remarks.

10. 1st, The *temperature* of the abdomen furnishes most important indications as to the nature of disease. It is generally always higher than natural in diseases of increased action; and is also often higher when the patient is actually complaining of cold, particularly at the commencement of fevers. In many fevers and inflammations of the abdominal viscera, particularly those of a dangerous or malignant character, the increased temperature is accompanied with a peculiar acrid pungency to the sensation of the examiner; a phenomenon which indicates the utmost risk of rapidly supervening disorganisaation. *Diminished temperature* of the abdomen is met with in the period of depression, or cold stage at the commencement of fevers, but very seldom at their termination, even in death, unless in the most malignant or liquescent forms. It is also met with after injuries of the abdomen, particularly blows on the epigastrium, in anæmia, chlorosis, and other disorders of debility.

11. 2d, The *form and size* of the abdomen are frequently altered, as already noticed (§ 6, 7.); but, in order to ascertain the nature of the alteration, various means of investigation are generally required, particularly those which remain to be considered. When proceeding with the manual examination of the abdomen, it is necessary very gently to increase the pressure, and, when acute pain is not complained of, to make it in various directions, — laterally, downwards, upwards, and backwards to the spine, — so that if altered sensibility of any of the contained viscera exist, it may not escape detection, but be accurately ascertained and estimated; and the examination should always be made with a careful observation of its effects upon the expression of the countenance of the patient. It will also often be requisite to per-

+ When examining the Abdomen with a view to ascertain disease of the liver, and also of other organs, it is proper & neceſsary to a satisfactory knowledge of the case, that after the patient has been examined in the posture here directed, he should then be placed in the upright or sitting posture, – the latter is more particularly recommended – and the manipulation be again repeated. – It is often found by this means that a tension near the right hypogastric region supposed to be owing to enlargement of the liver is really due merely to rigidity of the abdominal muscles.

form the manual examination, now with the points of several fingers, now with the whole of one, or even of both hands; and occasionally, at the same time that a full inspiration is being made. But it should always be performed with attention to the sensations of the patient, particularly as expressed by the countenance, and to the feelings and ideas it may excite in our own minds. Even the state of action in which the abdominal muscles are often thrown by the examination; the degree of pressure occasioning such action; and the circumstance of tension of those muscles preceding the examination, or being excited by it; as well as the continuance of their contractions, and the periods and occasions of their relaxation, are all important matters in our estimate of the state of the viscera underneath, — more particularly in the various states of inflammation seated in the peritoneum, in the alimentary canal, &c.

12. 3d, The *sensibility* of the parietes of the abdomen is most intimately associated with that of the contained organs, both in health and disease. The sensibility of the epigastric region varies most widely in different persons. It is frequently, even in tolerable health, very great in delicate and thin females. It is always so in inflammation of the viscera, more particularly when the serous membranes are affected; and the more superficial the inflammation, the more tender is the surface. In order to obtain an accurate idea of the state of the sensibility of the abdomen, pressure should be commenced in the gentlest manner, and with the fingers and palm of the open hand. When the patient cannot endure the slightest touch, the disease is then commonly in the parietes, or in the serous membrane reflected over them. When the cause exists more deeply, the tenderness is less acute, and the muscles are almost instinctively brought into action, even before pressure is made, in order to protect the diseased viscera from it.

13. When superficial tenderness is absent, the examination may be made with increased pressure, in order to ascertain the presence of tenderness, pain, or soreness, in any degree or at any part. But caution in thus increasing the pressure is always necessary when the parenchyma of an organ, particularly of the liver or spleen, is enlarged or otherwise affected; for many such affections may be very serious, and yet the sensibility of the diseased part not much increased. I have known rupture of an enlarged and softened spleen occasioned by the rudeness of the examination; and writers have mentioned similar accidents to have occurred to the liver.

14. 4th, The *tension and firmness* of the abdomen require attention, and due estimation of their actual amount; and in connection with the other diagnostic indications furnished by the examination. Thus, when the tension is associated with increased temperature and sensibility, inflammation of one or more organs underneath, particularly of the peritoneum, may be predicated. The tumefaction, degree of sensibility, position of the patient, &c. will further prove the accuracy of the diagnosis. Tension and firmness are always present in the different forms of peritonitis and inflammations of the subjacent viscera, but not uniformly throughout all their stages. Even in the worst or most malignant forms of peritonitis, as those met with in puerperal females, these symptoms are often either almost altogether wanting, or they exist for a short time only. When effusion of a serous or sero-purulent matter occurs in peritonitis, or when suppuration has followed inflammation of the enveloped viscera, tension as well as firmness disappear. They are generally, however, both present, even when the sensibility of the parietes is not much greater than natural, in chronic peritonitis with the formation of false membranes, or the agglutination of the opposing surfaces of the viscera.

15. 5th, The *presence of tumours* or other morbid growths, or the fact of their absence, has also to be ascertained by a manual examination. This information can be obtained only by this mode of investigation, carefully conducted. If we detect any degree of unusual tumefaction or hardness, we should endeavour to ascertain its exact site; its form, size, connections; its consistence, degree of sensibility; and whether it is fixed or moveable, soft and yielding, or hard; pulsatile or not. The situation of the tumour; its size, form, and degree of fixedness, will enable us to form an idea of the part affected: whilst the absence or presence of morbid sensibility in it, of fluctuation and pulsation, and the manner in which the nearest parts of the abdominal parietes are affected by it, will furnish important indications of its nature. When tumours or unusual circumscribed indurations are detected in any part of the abdomen, we should bear in mind that their sources and kinds are numerous: that they may be formed in the liver, pancreas, spleen, stomach, pylorus, mesentery, omentum, cæcum, kidneys, uterine organs, &c.; that their nature may be extremely various; and that they may consist either of accumulations of some fluid contained in a cyst, or infiltrated in the substance of an organ, or enclosed in its natural cavity, the outlet of which has been obstructed; or of a deposition of some morbid structure, the nature of which can only be known by a comparison of numerous symptoms, and the history of the disease. Care should be also taken that the accumulations of fæcal matters occasionally formed in the cæcum, and in various parts of the colon, or that an unusual anterior protuberance or curvature of the inferior dorsal or lumbar vertebræ, be not mistaken, as have sometimes happened, for morbid growths; and that unusually large collections of the natural secretions in their cysts, as of the bile and urine, owing to temporary obstruction to their discharge, be not treated as morbid formations of a very different kind. I have known cases in which distension of the gall-bladder, from great accumulation of the cystic bile, was mistaken for abscess of the liver; and an enormously distended urinary bladder was viewed as dropsy.

16. 6th, The *presence of fluids effused into the peritoneal sac* is best ascertained by placing the patient in the erect posture. If this cannot be done, and if he cannot even sit up, the shoulders and limbs should be placed low; and, whether in the erect or recumbent posture, the palm of one hand laid with a gentle pressure upon one side of the abdomen, whilst we tap, somewhat smartly with the other hand, on the opposite side. The impulse occasioned by the stroke will occasion, if fluid be effused, a vibratory undulation or shock which will be felt by the other hand, and which constitutes the diagnostic

symptom in diseases of the abdomen attended with effusion.

17. 7th, *Accumulation of fæcal matters* in the bowels are not unfrequently mistaken for tumours. These matters usually collect and harden in the cæcum, or in some part of the colon. They seldom accumulate in the small intestines, unless they consist of certain kinds of *intestinal concretions* (see the art.); which are with difficulty distinguished from tumours seated in some one of the abdominal viscera. It is indispensably requisite to examine the abdomen carefully in all cases of habitual or occasional constipation, particularly in the region of the cæcum and course of the colon; as, when conducted with an experienced tact and discrimination, these collections will generally be ascertained: and when the history of the case, and numerous contingent rational symptoms, are taken into account, little risk will be run of confounding them with morbid growths. The accumulation of secretions in the gall-bladder, and in the urinary bladder, are chiefly, particularly the latter, ascertained by manual examination. The diagnosis of those disorders is fully pointed out in another place.

18. 8th, *Protrusion* of some part of the abdominal contents, giving rise to any either of the more common kinds of *Herniæ*, or of those which are unusual, should never be overlooked. Inguinal, femoral, and umbilical herniæ are so frequent, and, when either incarcerated or strangulated, occasion so serious effects, that in all cases where severe symptoms are referred to any of the viscera contained in the abdominal cavity, or in its vicinity, or when the functions of the bowels are obstructed, this source of mischief should be particularly enquired into.

19. I may observe generally, in respect of manual examination of the abdomen, that it furnishes valuable means of diagnosis in very many diseases, particularly when estimated in due connection with those derived from other sources; but I should add, — what I shall often have to prove hereafter, — that it does not always give us exactly the same kind of information that is stated in several, and even in some very recent, works. Thus it is said to be the most certain means of ascertaining the presence of enlarged mesenteric glands, and by actually feeling these glands enlarged. Now this is not the case, and I state it from an experience of many hundred cases: for there are comparatively but few instances in which these enlarged glands can be satisfactorily detected, by the most careful manual examination. But this mode of investigation furnishes certain indications of their presence of a different kind from that which writers have laid down. It may also be remarked, that a manual examination of the abdomen is generally much more successfully made in lean subjects, in females than in males, and in children than in adults; whilst in muscular men, and in fat persons, it furnishes much less information, owing to the muscularity and thickness of the abdominal parietes.

20. III. PERCUSSION has been employed as a means of diagnosis in diseases of the abdomen from a very early period of medical knowledge, but chiefly with a view of recognising tympanitic affections, or unusual accumulations of air, and dropsical effusions; and it was not until very lately that attention was directed to it as a means of investigation in a very large proportion of other diseases of the abdominal viscera. Percussion of the abdomen as well as of the thorax is either *direct* or *mediate*: the former is that which was first ably insisted on by AUENBRUGGER, and brought into notice by CORVISART, chiefly in the investigation of thoracic diseases; the latter, both in its application to abdominal and thoracic affections, is the invention of M. PIORRY, who has paid great attention to its perfection, and has written ably on it as a means of diagnosis.

21. *Direct* percussion consists of simply striking the parts, somewhat smartly, with the points of two or more fingers united and brought to the same plane, and attending to the sounds elicited. *Mediate* percussion is performing the same with a thin plate of ivory, box wood, or any other hard elastic body, placed over the part to be thus examined, and striking upon it. The advantages derived from having such a body interposed between the surface and the fingers are, 1st, The part is protected in a great measure from the stroke, which, although slight, yet is frequently unpleasant to delicate and sensitive persons; 2d, It assists in the production of the sound for the obtaining which percussion is employed. (See art. PERCUSSION.) The body on which the percussion is thus made usually consists of a small ivory plate of about 2½ or 3 inches in diameter: M. PIORRY calls it the *pleximeter*, or measure of percussion. In all cases in which we wish to examine the abdomen by percussion, it will be necessary to use the pleximeter. The information it conveys varies according to the state of the parts underneath. If we place it over the liver, percussion gives out a dull sound; from the circumstance of a dense body lying beneath that part of the abdominal parietes: if it be moved in the course of the stomach and colon, a sound will be elicited clear in proportion to the quantity of air contained in these viscera.

22. During our investigation of the abdominal contents with the aid of mediate percussion, it will be necessary to attend to certain facts: — 1st, That the pleximeter will furnish, in the same person, a sound varying from dull to tympanitic as the parts over which it may be placed differ in density and the quantity of air they may enclose; 2d, That in situations of the abdomen where, owing to the quantity of air usually contained in the bowels, mediate percussion generally gives a tympanitic sound when the plate is placed lightly on the surface, it will give a much duller, or even a dead sound, when pressed inwards so as to displace the air from underneath it, and to approach nearer to some solid body, or to bring the parts nearer to that condition by the pressure; 3d, That the stomach and whole tract of the intestinal canal always contain a certain quantity of air or gaseous fluid, particularly the large bowels; and that they approach more nearly to the abdominal parietes in proportion to their distension, whether with air, or with fluid or more or less solid contents; and, 4th, The quantity of air contained in the digestive tube, especially the stomach and large bowels, is great in proportion to the deficiency of its vital energy, and the degree of inflammatory action affecting it.

23. These facts being attended to in our investigations of abdominal diseases by means of percussion, mediate or direct, the extent of the

+ Since this was written this method of ascertaining pregnancy has been much practised, and it is now agreed by all accoucheurs to be one of the most satisfactory methods of ascertaining the existence of pregnancy. Two sounds, at least, have been distinctly made out – one – called the placental murmur, but in reality owing to the rush of blood thro' the enlarged & contorted uterine arteries, is a single whizzing sound synchronous with the pulse of the mother & heard most clearly in the inguinal regions: the other, a double sound beating 120 or 130 in the minute & heard best & generally midway between the scrobiculus Cordis & the symphysis Pubis – a little to the left – this is the pulsation of the fetal heart. – The former sound may be detected at the 10th or 12 week of pregnancy, the latter, not until the 4th or 5th month – where it is clearly heard it is the most conclusive evidence of pregnancy that can poſsibly be had.

liver may be distinctly traced by its means; and the degree of inflation of the bowels, or stomach, may be ascertained with tolerable certainty. When the stomach is nearly empty (for it always contains some air secreted from its internal surface), it retracts backwards, and recedes from the abdominal parietes towards the centre of the trunk; having then the colon, more or less distended with gas, placed before it. As it becomes filled with air or the ordinary ingesta it extends to the left hypochondrium, and approaches the left and anterior parietes of the upper zone of the abdomen. In proportion to the quantity of air it contains, percussion gives out a clear sound, which is dull or dead as it is filled with fluid or solid ingesta, and as the air is displaced. When we know that the stomach must be empty of food, and yet find that a dull sound is emitted on percussion, we should always suspect organic disease. In these cases air is often secreted with great rapidity from its internal surface, but is immediately expelled, owing to the irritable state of its muscular coats, without being retained, and before any very material distension of the viscus is occasioned by it.

24. The small intestines generally contain air; although, I believe, much less than is usually found in the large bowels. In a state of health, particularly a few hours after a meal, when the chymous matter is passing along them, percussion over them,—that is, over the umbilical region, and the immediately adjoining parts of the surrounding regions,—generally yields a dull sound; which becomes clear in proportion to the quantity of air they contain, excepting in very fat persons. In a great majority of abdominal diseases, the quantity of air contained in the small intestines is increased much beyond what exists in health: this is particularly the case in several diseases of debility, as chlorosis, indigestions, colicky affections, torpid states of the liver, constipation, certain states of fever, hysteria, &c.; and still more so in inflammatory states of portions of the digestive tube, in peritonitis, in puerperal fevers, &c.

25. When the mucous surface of the bowels or of the stomach is irritated or inflamed, the quantity of air secreted is often very great; but, excepting in the slighter states of such diseases, it is seldom retained within the sphere of the inflammation so as to occasion that degree of distension which may be detected by percussion, although it is often retained in adjoining parts of the tube, occasioning distension, great pain, tormina, &c. This disposition to expel the morbid collection of air arises from the irritability of the muscular fibres of that part of the intestines, the mucous surface of which is in a state of irritation; the morbid action of these fibres propelling it either upwards or downwards, where it may accumulate or be evacuated, but most commonly into the large bowels, or into the duodenum and stomach, where it may be detected by percussion. In diseases which paralyse the contractile actions of the muscular coats of the bowels, as the malignant puerperal peritonitis, the last stages of enteritis, rabies canina, and the advanced states of adynamic fevers, the quantity of air which is secreted and accumulated in the whole digestive tube, and the consequent distension, are often enormous. The sound on percussion, in these cases, generally becomes quite tympanitic long before death, indicating the cause, as well as the lost tone of the muscular coat of the canal.

26. The phenomena now noticed to occur in respect of the small intestines affect, in a still more marked manner, the large bowels; flatulent distension of these being readily traced by mediate, or even direct percussion, particularly in the course of the colon, even when the small intestines are comparatively free from it.

27. It is not merely the presence of accumulated air in the different parts of the digestive tube, and the important pathological and therapeutic indications to which the knowledge of this fact naturally leads, that render percussion of the abdomen a valuable means of investigation, but it is also the information it conveys of the existence of more solid formations—of fluid collections, and morbid productions. Unusual distension of the bladder; all the forms of abdominal dropsy; ovarian diseases; purulent collections in, or enlargements of, the liver; tumours of every kind, particularly when they reach a considerable size; enlargements of the spleen or kidneys, &c.; are more readily and earlier detected by means of mediate percussion than without this aid: and, in all these, the sound emitted is dead over the diseased part, and becomes clear as the boundary of disease is passed, and when the plate is placed over the hollow viscera.

28. IV. Auscultation, mediate or direct, particularly the former, is often necessary in abdominal diseases, particularly in ascertaining whether or not the large vessels are affected; and even in tracing disease of the right side of the heart and of the pericardium. It may also be useful in those diseases of the liver which extend to the lungs through the diaphragm, particularly abscess, or hydatidic cysts of the liver breaking into the lungs. Auscultation of the abdomen has been resorted to by M. Kergaradec to ascertain the existence of pregnancy; and by M. Lisfranc, to determine the presence of stone in the bladder, when the sound is imperfectly heard to strike against it.

Bibliography. *Baglivi*, Prax. Med. lib. iv. c. 9. — *Double*, Semeiologie Générale, t. i. p. 383. — *Cruveilhier*, Dictionnaire de Méd. et Chirurg. Prat. t. i. — *Piorry*, De la Percussion Médiate, Paris, 1828; et Procédé Opératoire dans l'Exploration des Organes par la Percussion Médiate, Paris, 1830.

ABORTION.

Syn. *Abortus, aborsus, affluxio.* *Διαφθορα, ἐκτρωμα, ἐκτρωσμος,* Arist. *Αμϐλομα, εξαμϐλωσις,* Hip. *Avortement,* Fr. *Aborto,* Ital. *Falche Geburt, Fehlgeburt,* Ger. *Miscarriage,* Eng.

Classif. 5. *Class*, Diseases of the Sexual Function; 3. *Order*, Affecting Impregnation (*Good*). I. Class; V. Order (*Author*, see *Preface*).

1. Defin. *The expulsion of an embryo or fœtus which is either already dead, or is at a too early period of fœtal existence to live.*

2. This definition will distinguish *abortion* from *premature labour*, which latter is applicable to delivery after the sixth month, when the fœtus may live; and from *false delivery*, which signifies the expulsion of a mole, or false germ instead of an embryo. Under this term I also include expulsion of the ovum before the sixth week, commonly called *miscarriage*.

3. Causes. These may be divided into such as act primarily upon the mother, or depend

upon her; and into those which are connected with the product of conception, and are owing to diseases of the fœtus and its appendages. (DUGES.) Or they may be divided into the predisposing, exciting, and efficient causes. It will be necessary to consider the causes with some relation to these distinctions.

4. I. *Predisposing causes.* The disposition to abortion is, in some females, so strong that the slightest exciting cause will produce it; in other females the most serious injuries, and the most violent mental and moral impressions, are insufficient to occasion it. Some of the predisposing causes are referable to the mother, others to the fœtus and its appendages.

5. *A.* The predisposing *causes referable to the mother* are numerous, and consist of certain states of the uterus, and particular conditions of the habit and constitution, influencing either the uterus or the embryo itself.

6. The *conditions of the uterus* favouring abortion are great rigidity of its fibres, and an unyielding state of its parietes, opposing too great a resistance to the dilatation which the organ must necessarily experience; too great sensibility and contractility of the uterus, in the former of which states the other organs of generation often also participate; too great a flow of blood to the uterus and ovaria, either proceeding constitutionally, or from causes which excite the nerves of these organs or parts adjoining; feebleness and relaxation of the neck of the uterus, — a condition of the parts which M. DESORMEAUX states he has frequently ascertained to exist in females subject to abortion; and atony of the uterus itself, either from original constitution or long-continued leucorrhœa, or from a severe or protracted labour, a cause which may be conjoined with the one preceding it. The foregoing causes are chiefly productive of those abortions which occur at the same period of pregnancy, and which have been called periodic by some authors.

7. To the above may be added, as strictly referable, a condition of the organ called by PEU immoderate heat of the uterus, which is attributable to an excited condition of the nerves of the organ, and a chronic inflammatory or irritative state of its vessels; also scirrhus, fibrous, fleshy, steatomatous tumours of the uterus; polypus, dropsy, the presence of several children, and the too rapid or too great dilation of the organ thereby occasioned; tumours of, and fluid effusions into, the substance of the ovaria; and inflammation of the ovaria and parts adjoining.

8. The causes chiefly referable to the *constitution and habit of the mother* are certain states of the atmosphere, to which only can be attributed those frequent abortions sometimes observed, which have even assumed an epidemic form, and of which HIPPOCRATES, FISCHER, TESSIER, DESORMEAUX, and others have made mention; the sanguine and irritable temperament; plethoric habit; a constitutional disposition to hæmorrhage independently of, or connected with, the foregoing states; habitual menorrhagia; irregular menstruation; great debility of body; excessive sensibility, susceptibility, and mobility of the nervous and muscular systems; hysterical states of the nervous system; the syphilitic and the mercurial poisons; a cachectic condition of the frame; painful and chronic diseases; addiction to masturbation in early life; curvatures of the spine; malformations of the spine and pelvis; hereditary disposition; an acquired disposition arising from previous abortions caused by accidental circumstances; marriage or impregnation late in life; deficient or improper nourishment; too close cinctures of the body; worms in the intestinal canal; conception at a too early period after delivery, or after a previous abortion; the atonic state of plethora generated by luxurious indulgences, by sleeping in soft and too warm beds, by indolence, a too full diet, &c.; local plethora, or excitement of the uterine organs, occasioned and kept up by sensual gratifications; and the constitutional and local commotion occasioned by infectious, exanthematous, pestilential, and febrile diseases.

10. *B. The causes which depend upon the fœtus* are referable either to the fœtus itself or to its appendages. They operate either by favouring the death of the fœtus, which acts then as a foreign body in the uterus, exciting the organ to expel it; or by impeding its growth, so that it does not consume, or does not afford a ready circulation to, the blood sent to the uterus; thus occasioning an accumulation of this fluid in the uterine vessels, and consequently congestion, terminating in hæmorrhage and the expulsion of the embryo. Owing to these circumstances, abortion is favoured by debility, or imperfect developement of the fœtus; by monstrous conformation, and disease affecting it at some period of its early growth; by the imperfect adhesion of the placenta to the surface of the womb, or its implantation over the neck of the organ; by disease of the placenta, as inflammation, apoplectic hæmorrhage into its substance, calcareous deposits, fatty degeneration, scirrhous or cartilaginous induration; the formation of serous cysts, of hydatids, aneurism, or varices of this organ; by atrophy, hypertrophy, or disproportionate size of the placenta; by a too short or a too long umbilical cord; by twisting of the chord around the neck or one of the limbs of the fœtus; by diseased structure of the chord itself, as extreme tensity or softness, the formation of tumours or hydatids in it, by knots or adhesions preventing or impeding the circulation through it; great tenderness of the membranes of the ovum; inflammation, thickening, opacity, and irregularity of the membranes; the presence of too much or too little amniotic fluid, and collections of serum, or of a sanguineous fluid, between the chorion and amnios; adhesions formed between the placenta and parts of the surface of the fœtus; and, in the more advanced periods of gestation, constitutional diseases, particularly eruptive and infectious diseases, or continued fevers, extending from the mother to the embryo.

10. II. *The occasional exciting causes* are extremely numerous. It may be even said, that there is scarcely an occurrence in life which may not be occasionally concerned in producing abortion. (DESORMEAUX.) The chief causes of this class are acute diseases; such as fevers, scarlatina, measles, small-pox, and inflammations, particularly of the uterus, ovaria, pelvic peritoneum, colon, &c.; the irritation of adjoining viscera; diarrhœa, dysentery, tenesmus, colic, constipation, hæmorrhoids; hysterical and epilectic convulsions; syphilis; violent pain; disappointment and anxiety of mind; anger, fright, excessive joy;

the impression of various odours; threatened asphyxia, particularly from the vapour of carbon; violent exertions and fatigue; dancing; riding on horseback, or in an uneasy carriage, or on a roughly paved road; excessive venereal indulgence; severe coughs; hiccup; immoderate laughter; vomitings; sea-sickness; injuries on the loins or abdomen; any sudden shock, even the extraction of a tooth; the use of irritating or drastic purgatives, or of emmenagogues; pediluvia; hot-baths; large blood-lettings, particularly from the feet; convulsive movements of the fœtus; rupture of the umbilical cord or of the membranes; adhesions formed between the serous surface of the fundus of the uterus and the adjoining viscera, preventing the dilatation or the ascent of the womb, and occasioning its reaction on its contents.

11. The foregoing causes act variously in producing abortion. Some of them may produce directly a separation of the placenta from the surface of the uterus, particularly when the placental mass is very considerable; but this is a rare occurrence, and can only be inferred to exist when uterine hæmorrhage follows immediately upon the application of the exciting cause. A violent shock, injury, fall, compression of the uterine region, riding, dancing, coition, &c. may have the immediate effect, or they may occasion rupture of the cord or of the membranes; but more frequently these, and, in a still more particular manner, the other exciting causes, produce certain intermediate effects, as congestion of the vessels of the womb, which is soon followed by hæmorrhage and by separation of the placenta; or they occasion contractions of the uterus, owing to the excitement and irritation of its nerves, or of the nerves of adjoining or sympathising parts, the separation of the placenta, and expulsion of the fœtus.

12. KLEIN and many other authors have remarked that the causes of abortion generally have a more marked effect at the period at which the menses would have returned in the unimpregnated state. The *molimen*, or tendency to congestion in, and hæmorrhage from, the uterus, which then may be supposed to exist, renders it more susceptible of being injuriously impressed by the occasional causes of the disease; and, where other predisposing causes are already in existence, has a direct influence in separating the placenta, and inducing uterine contraction and abortion: several of the causes produce spasmodic or convulsive actions, which are sympathetically transmitted to the uterus, whilst others seem to act primarily on the fœtus. The direct action of certain of the exciting causes on the fœtus may be doubted; but every experienced and observing practitioner must have remarked the very frequent and immediate effect of strong passions of the mind of the mother upon the motions of the fœtus, inducing convulsive actions, painfully and distinctly felt, and sometimes followed by its death. Amongst the most common exciting causes of abortion are those means which, from their occasional action in this way, have been called *abortives*, and which the practitioner should be acquainted with, so as to enable him the better to counteract their effects.

13. The production of abortion is a felonious act, and one which the practitioner never will resort to, except in the case of irreducible retroversion of the uterus. The means usually resorted to by females themselves, or by persons who criminally usurp the medical character, and employ feloniously the little empirical knowledge they may have acquired, either surreptitiously or otherwise, are, large bleeding from the feet; pediluvia; violent emetics; drastic purgatives, particularly those which act upon the colon and rectum; active emmenagogues, as savine, ergot of rye, juniper, hellebore, &c.; and stimulating injections into the vagina: also various mechanical means employed to break the membranes, or to procure the discharge of the amniotic fluid. Many of the foregoing, or all of them excepting the last, will often fail of producing the desired effect. They frequently also succeed, and sometimes they occasion the death of both mother and fœtus. MAURICEAU, DE LA MOTTE, BOER, DESORMEAUX, DUGES, BURNS, HAMILTON, RYAN, &c. have satisfactorily shown the uncertainty of those means, and have met with numerous instances in which they had been carried to the utmost extent without acting in the way desired; but had occasioned enteritis, dysentery, peritonitis, metritis, and other dangerous diseases. Many cases are also on record where attempts had been made to produce abortion by puncturing the membranes; and the uterus itself had been penetrated, and the death of the mother thereby occasioned. It is a matter of the utmost difficulty, even to the most expert surgeon, to puncture the membranes at that period of pregnancy when it is usually attempted by ignorant persons; the only persons, indeed, who would make the attempt.

14. THE SYMPTOMS of abortion vary remarkably with the period of pregnancy at which it takes place: also with the cause producing it. They do not, therefore, admit of being divided into precursory and essential symptoms: the former being frequently wanting. In the two first months of pregnancy the ovum, which is then small, is sometimes expelled without any remarkable pain or hæmorrhage; but more frequently there are pains, accompanied with coagula, in which the ovum is generally enveloped, and where it often escapes observation. This is particularly the case when, the membranes being broken, the embryo escapes without the placenta. At this early period females often suppose that they have been the subject merely of an interruption of the menses, followed by a more abundant and painful return of them than usual, instead of a true abortion, or miscarriage.

15. As the period of utero-gestation advances, and the size of the fœtus increases, the pains and hæmorrhage accompanying abortion are augmented; the hæmorrhage being generally more considerable than that attending delivery at the regular period.

The abortions which proceed from chronic diseases, or from causes acting slowly, and particularly those which are occasioned by morbid states of the embryo, or of its membranes, are generally preceded by horripilations or rigors, followed by febrile movements, by heat, want of appetite, nausea, thirst, pain in the loins, lassitude, leipothymia, syncope, coldness of the extremities, palpitations, lowness of the spirits, paleness of countenance, tumefaction or lividity of the eyelids, deficient brightness of the eyes, fœtor of the breath; a feeling of weakness in the abdomen, or of cold about the pubis; of weight about the anus and vagina; flaccidity and diminished size of the breasts, sometimes with a slight discharge of serum; a flow of a sanious, then of a sanguineous fluid, and afterwards of blood, either in a fluid or grumous state, from the vulva; diminished motion of the child, soon afterwards followed by perfect cessation of motion; lessened bulk of the abdomen or of the hypogastrium; uterine pains, which become more and more frequent and severe; progressive dilation of the uterine orifice, and prominence of the membranes; and, lastly, expulsion of the amniotic fluid and fœtus, followed, at an indefinite time, by the placenta. Most frequently the discharge of blood does not cease until the placenta is expelled. (DESORMEAUX.)

16. Abortion proceeding from the more energetic exciting causes is sometimes preceded by pains, and an unusual sense of weight in the loins; and at the lower part of the vagina by horripilations or rigors, by general uneasiness, and cardialgia or nausea. From the first there is often an appearance of blood, followed by the discharge of a sanguineous serum, which soon passes into serious hæmorrhage. In other cases the action of the cause is instantly followed by a large effusion of blood, which continues until after the expulsion of the fœtus and its appendages. Frequent lancinating pains dart through the abdomen, chiefly in the direction of the umbilicus and vulva: the uterus makes efforts at expulsion, and the fœtus is expelled. The more advanced the term of pregnancy, the nearer do the symptoms approach to those of delivery at the full time; and the nearer also do its consequences assimilate to those following upon a natural confinement, as the lochial discharge, after pains, milk-fever, &c.

17. It is sometimes observed, even up to the middle period of utero-gestation, that the fœtus is expelled enveloped in its membranes. But it sometimes also occurs in the first months, that, after the rupture of the membranes, the fœtus and placenta are retained, decomposed, and discharged in the form of a brown fœtid sanies. In other cases the placenta is not expelled until several weeks after the fœtus, either in the state now described, or in that of a putrid mass. It occasionally is observed that the placenta continues attached to the uterus, and is nourished, increasing in size, and assuming the appearance of a fleshy mass, in which are sometimes found simple cysts, or cysts containing hydatids. This latter occurrence takes place either when the fœtus had been expelled, or had died at an early period of its formation; and, whilst it was yet small and nearly gelatinous, being dissolved during the process of decay in the amniotic fluid, or preserved in it.

18. This change in the placenta forms what has been called by DESORMEAUX and others the *mole of generation;* the chief character of which is that it possesses a cavity lined with a smooth membrane, the remains of the amnion. Frequently, at the more advanced periods at which abortion takes place, the fœtus is expelled alive; but the duration of its life subsequently depends upon its age, and the circumstances attending its abortion. It sometimes also is dead before it is expelled, occasionally for a considerable time; although it may have reached the age of several months. Its death does not necessarily lead, although it does generally, to its expulsion. In some cases it is retained even up to the full period of utero-gestation, and is then thrown out in a state of peculiar softening and maceration, but without putrefaction: this only occurs when the membranes have remained entire, and air been excluded from the interior of the uterus. In other instances it is converted into a substance resembling adipocire, or the fatty substance generated during the decomposition of animal matter. In rarer cases the fœtus and envelopes become hardened, and even converted into a bony or petrous state, and retained till the natural death of the mother; or, in the course of some months, or even years, occasion inflammation of the uterus, and suppuration. Sometimes, in cases of this latter description, a portion of the uterus forms adhesions to the parts opposite; the abscess which is formed extending in that direction, and opening on the surface of the abdomen, or in the interior of the intestinal canal, or into the vagina, and giving issue to purulent matter, mixed with a fœtid sanies, and portions of bones arising from the decomposition of the textures of the embryo. But these latter consequences of abortion are rarely met with unless in cases of rupture of the womb, or extra-uterine impregnation.

19. In some cases of abortion the hæmorrhage from the uterus continues to a serious extent for several days. This may be the case at various epochs of pregnancy; and may result from the detachment, partial or general, of the placenta, and its retention along with the fœtus in the uterine cavity, owing to imperfect action of the uterus to eject it. It may also proceed from the expulsion of the fœtus, and the retention of the placenta, either altogether or partly separated from the uterus. In some cases the presence of the placenta, or of a portion of the membranes in the womb, or in the os uteri and upper part of the vagina, by the irritation thereby occasioned, may have the effect of keeping up a constant and exhausting hæmorrhage. In a case of abortion to which I was recently called, the practitioner in attendance stated the fœtus to have come away two or three days previously. Upon enquiring as to the discharge of the appendages, I was led to recommend an examination *per vaginam;* when they were found lodged partly in the vagina and os uteri. After their removal the patient rapidly recovered.

20. DIAGNOSIS. The diagnosis of abortion should be directed to three objects: 1st, its cause; 2dly, to the possibility of preventing its occurrence; and 3dly, to ascertaining the stage or developement of the process. The causes of abortion are generally readily recognised, and admit of an easy explanation. There are two, however, to which Professor DESORMEAUX has particularly directed attention; namely, rigidity of the fibres of the fundus and body of the uterus, and laxity of its neck. The former of those is generally connected with a similar state of the whole system, and accompanied with scanty or painful menstruation. In the first impregnations abortion takes place at an early period; but in subsequent impregnations the period of gestation approaches more nearly the natural epoch, the female at last bearing children to the full time.

When the abortion is referable chiefly to laxity of the neck of the uterus, a result contrary to the foregoing takes place; the period of abortion approaching nearer, in successive conceptions, to the time of impregnation. Examination per vaginam discloses this state of the cervix uteri, which sometimes permits the escape of the ovum without much pain. The presumed existence of either of the foregoing states, particularly if any of the symptoms enumerated as characterising abortion be present, should lead us to suspect its approaching occurrence. And it may be considered as commenced if pains occur at regular intervals, which become of shorter duration, and are directed from the umbilicus to the os coccygis; if the os uteri dilates, if the membranes become prominent during the pains; and if the amniotic fluid escape. M. DESORMEAUX, however, has detailed instances where, notwithstanding the above phenomena, the patient was not delivered for several weeks afterwards; but these are extremely rare.

21. In cases where more than one child is contained in the uterus, or where this organ is double, one of the fœtuses may be expelled in the course of gestation, and the other may still remain and arrive at the full period of fœtal life. The eminent author whom I have now quoted mentions the case of a female, pregnant for the first time at the age of forty years, who experienced abortion at two months and a half: the symptoms of pregnancy, however, continued, and the motions of the fœtus were felt at the usual time. At the seventh month, a severe fright was immediately followed by symptoms indicating the death of the child; however, the motions of the child were still felt in the uterus: at last, after two months, and at the usual period of gestation, this female was delivered of a dead child, and of another which had arrived at the full period, and was living and healthy. M. ROUSSET has also related a similar case (*Traité de l'Hystérotokie*). When abortion occurs during the first two months, we can often only distinguish it from excessive menstruation by the coagulating of the blood. Cases, however, sometimes are met with where coagula form during menstruation, but seldom or never during healthy menstruation. Abortion is most frequent during the three first months of pregnancy.

22. PROGNOSIS. Abortion has been considered of more serious import than delivery at the full time, by HIPPOCRATES, ÆTIUS, MAURICEAU, and others. The prognosis will, however, entirely depend upon the nature of the causes producing abortion; the period of gestation at which it takes place; and the symptoms accompanying it. It may be stated generally, that the danger increases in proportion as it approaches the full period of gestation; inasmuch as the hæmorrhage is greater, the expulsion of the fœtus and appendages more difficult, and the milk-fever more violent, the longer the period of utero-gestation. The abortion which occurs from accidental, or active exciting causes, is generally more dangerous than that which follows the predisposing causes; this is more particularly the case, the more violent the cause, the more prompt its effects, and when it acts upon females not predisposed to abortion. The most dangerous abortions are those which are procured by substances of an irritating nature taking internally, and by attempts to excite the uterus, or to puncture the membranes per vaginam.

23. On the other hand, when abortion takes place spontaneously, and without any very manifest or sufficient cause, it is often unattended by pain or difficulty, leaving behind it scarcely any unpleasant consequences: but this form of abortion is most liable to recur; and its repeated occurrence often gives origin to a number of ailments, some of them of serious moment, such as irregular menstruation, chronic metritis, organic lesions of the uterus and ovaria, irritable uterus, hysteria, and a debilitated and cachectic habit of body.

24. Abortion is chiefly dangerous from the *hæmorrhage* attending it; and hence the risk is proportionate to the extent of this effusion. Abortion, accompanied by convulsions, diarrhœa, dysentery, or supervening in the course of fevers, inflammations, or of eruptive diseases, are seldom devoid of danger, which, under certain circumstances, is even great. Inflammation of the womb of great severity, endangering the life of the patient, or causing adhesions of the Fallopian tubes or of the ovaria to the serous surface of the uterus, and consequent sterility, is not an unfrequent consequence of abortion.

25. On the other hand, it may be productive of certain advantages, according to MAURICEAU, DESORMEAUX, and some others, who have, in rare cases, observed abortion occurring before the third month to be followed by a more regular state of the catamenia, in those who had been irregular previously, and by an improved state of health; even fecundity taking the place of former sterility.

26. TREATMENT. The treatment of abortion is divided into, 1st, the preservative; 2d, the palliative; and, 3d, the remedial. On each of these I shall offer a few remarks.

I. The *Preservative* treatment comprises the following objects; viz. to remove the predisposing causes as far as this may be accomplished; to repress all undue action whenever it may appear; and to prevent, as well as to counteract, the effects of the exciting causes. These ends are to be kept in view, and applied to individual cases, appropriately to the causes and circumstances by which they are characterised. Where plethora, general or local, exists, it should be reduced by general or local depletion, in very moderate quantity, and repeated at short intervals; but more preferably by a low and antiphlogistic diet and regimen, acidulous and cooling beverages, the recumbent posture, and tranquillity of mind. In cases characterised by relaxation of the system, and of the reproductive organs, an opposite, or a tonic and invigorating, regimen is required. In every instance the preservative treatment must be based upon our views respecting the pathological state of the uterus, and of the whole frame at the time of prescribing it.

27. When the horizontal posture is considered necessary, the patient will be more benefited by reclining on a mattress, than on a soft, hot bed. Her apartment should be cheerful, large, and airy; the bed-clothes light; and all anxiety of mind respecting the issue, and depression of spirits, prevented; a confiding and cheerful state of feeling will materially conduce to a favourable result.

The *diet*, under ordinary circumstances, ought to be light and digestible, and varied according to the particular circumstances of the case. The *beverage* should be mild, and, in cases of local or general plethora or excitement, rather cooling than otherwise, and such as may promote, rather than retard, the natural actions of the bowels. Lemonade, imperial, barley-water, toast-water, &c., are amongst the best in this class of cases.

28. Much will depend upon the perseverance with which this plan may be followed, particularly in cases of habitual or precedent abortions; where it ought to be rigorously enforced and continued for months, or, at least, for a long time after the period of gestation at which the former abortion occurred. If the threatened abortion be accompanied with pains, or by any degree of discharge, an opiate should be given at bed-time; and, in every case where we have conceived it requisite to abstract blood, either generally or locally, even as a preventive measure, the operation should be followed by a dose of opium.

29. Attention to the bowels is indispensable; but great discrimination is necessary in the choice of laxatives when the bowels are constipated. These should be of the most cooling and gentle description. The soluble tartar, and cream of tartar in the form of electuary, or with confection of senna, particularly in cases of plethora, are very eligible. Castor oil, with a very few drops of laudanum, which will not retard its operation; or small doses of the super-sulphate of potash, are also suitable laxatives.

30. When, from our knowledge of the state of the ovum, in previous abortion, we suspect a repetition of it, we may endeavour to prevent it, by using those means which are most successful in imparting energy to the constitution, and, through it, to the generative functions; so that the process of fœtation may proceed to a successful issue. This is, perhaps, best accomplished by change of air; the use of the tonic mineral waters, both internally and in the form of baths; by the mineral acids given in the infusions of bitter tonics, or with the solutions of the salts of iron: as the tinct. ferri muriatis; the tinctura ferri ætherea (see *Appendix*); by the sulphate of zinc, with the compound infusion of roses; by the exhibition of the various balsamic and terebinthinate medicines, combined with the pulvis cinchonæ, or the pulvis rhei, and the subcarbonate of the alkalies, or magnesia; and by attention to the state of the bowels, to diet, and gentle but regular exercise. The balsams most serviceable in cases of this description, as well as in all those characterised by weak and imperfect uterine function, are the balsams of Peru, of Canada, of Chio, and of Copaiba; the terebinthina vulgaris, and T. Veneta. SIEBOLD recommends the balsamum vitæ Hoffmanni (F. 317.), a medicine which enjoys great reputation on the Continent in many diseases of debility. The loins may be rubbed night and morning, for some time, with the linimentum saponis et camphoræ comp. (F. 306.), the linimentum terebinthinæ compositum (F. 311.), or the liniment. anodynum (F. 298.). The application of the emplastrum cumini, the emplastrum picis compositum, or the emplastrum roborans (F. 118.), to the loins will also prove of service.

31. When diarrhœa occurs during the period of utero-gestation, and more especially if it be accompanied with tenesmus, in delicate females, or in those who have experienced previous abortions, it should be immediately checked or lessened. In these cases disorder is chiefly confined to the colon and rectum, which should be soothed by small emollient and anodyne enemata, or by the use of suppositories of lead plaster, and opium. Whilst, however, we thus prevent the irritation from being extended from the large bowels to the uterus, we should take care to prevent the retention of hardened fæces in the cells of the colon, by which irritation will be perpetuated; and to remove them, when we suspect their presence, by the use of gentle laxatives, and emollient and aperient injections, avoiding the use of saline purgatives and cathartics.

32. In cases of threatened abortion in debilitated constitutions, the mineral acids, particularly the sulphuric, either with or without small doses of laudanum, or combined with small doses of colchicum, or of digitalis, are extremely useful. Where the circumstances of the case permit the horizontal posture to be dispensed with, the patient may be allowed very gentle exercise, for short periods, in the open air, avoiding all exertion and local excitement. She should live abstemiously, yet not too low. In many cases of this description a glass or two of light wine may be allowed daily, and in several a still more tonic treatment is required. When this is the case, the infusion of calumba, or of quassia, with the carbonate of soda and tincture of hyoscyamus, has seemed to me very serviceable; and the patient has been allowed the occasional use of the swing, or a gentle ride in a carriage. The tepid and cold hip-bath, particularly with sea-water, are often of use in cases of this description, as well as the treatment recommended in a preceding paragraph. The necessity of abstaining from sexual intercourse, in all cases of threatened abortion, is most evident.

33. In cases accompanied with incipient discharge, either the cold hip-bath, or sponging the hips, thighs, and lower parts of the trunk with cold water and vinegar; or by squeezing a large sponge filled with cold water, so that its contents may fall in a scattered stream from some height upon the hips and pelvis; will sometimes be serviceable. Injections of cold or iced water, or cold astringent solutions per vaginam, or a lavement of cold water, will sometimes arrest the accession of hæmorrhage.

34. It will occasionally be observed that weak, nervous, and delicate females are often irritable and dispirited from a tedious confinement, during gestation, and even abort owing to this cause; obviously, in many cases, from the effect produced upon the uterus, and upon the nutrition and health of the embryo. This should be anticipated, and prevented by a timely relaxation of the plan, and by allowing the patient as much exercise, amusement, &c., and by adopting as much of the treatment recommended above (§ 32.), as may be consistent with the accomplishment of our end. When, in these cases, the nervous symptoms predominate, the use of antispasmodics, with anodynes, and their combination with vegetable bitters, chalybeates, &c., are often required. The diet should also be nutritious, but easy of digestion, and not too heating and stimulating.

35. The foregoing plan will often succeed in

preserving the infant, unless the discharge continues or becomes more copious; the uterine pains, with the other symptoms of commencing abortion, still persist or increase; and the woman be advanced in pregnancy; when little advantage will be obtained, particularly if the orifice of the womb dilate. When this is the case, attempts at preservation will entirely fail, and we must adopt the second intention.

36. II. The *palliative* measures now required consist, in addition to those recommended (§ 33.), of cold applications to the genital fissure and insides of the thighs, and the *tampon*, or plug, as recommended by a number of authors, and sanctioned by Denman, Hamilton, Burns, Merriman, Dewees, Ryan, &c. These are especially requisite where the hæmorrhage is great, particularly when the abortion takes place between the third and sixth month. Opium, with the superacetate of lead, given in a very large dose at the first, and repeated according to circumstances, should also be exhibited. Opium, as well as plugging the vagina, are chiefly serviceable where the hæmorrhage continues after the expulsion of the embryo. The plug recommended by Dr. Dewees is a sponge squeezed out of vinegar. Dr. Ryan advises either old linen or a sponge to be wetted with a saturated solution of alum, and smeared with some oleaginous matter, to be passed up the vagina, so as completely to fill it. Dr. Blundell directs a scruple of alum, dissolved in a pint of water, to be injected into the uterine cavity.

37. The practitioner should in every instance be satisfied as to the expulsion of the embryo and the whole of its appendages, for he may be deceived in this matter (§ 19.); a small remnant of the placenta or of the membranes, when still left in the cavity of the uterus, or even lodged in its orifice, being often sufficient to keep up an exhausting, or even dangerous discharge. When the embryo only is expelled, the appendages being still retained, or when the hæmorrhage is great, the entire ovum still remaining in the uterus, the ergot of rye will often prove of inestimable service: and when given in the form of decoction, with as much borax as it will dissolve, will seldom disappoint our expectations. When a portion of the appendages remain at the orifice of the womb, it may be drawn down by the finger, or by a curved dressing forceps. In cases of great hæmorrhage in the early months of pregnancy, the ovum being retained, Dr. Burns advises the use of smart clysters, and plugging the vagina. In every case of hæmorrhage from abortion, as well as after delivery at the full period, but particularly when the hæmorrhage proceeds from inefficient contraction of the uterus and retention of the ovum, or some portion of the appendages of the embryo, I have prescribed, with complete success, an enema, with from one to two ounces of the oleum terebinthinæ in a pint of water-gruel.

38. The injection of water into the rectum, or a solution of acetate of lead and opium, has been advised by Dr. Dewees and Dr. Conquest. When the hæmorrhage occurs in robust and plethoric females, and the discharge has not produced much exhaustion, venæsection may be tried. In cases of this description, digitalis, in half-drachm doses, has been recommended: but, owing to the loss of blood, the effect, although not produced with the necessary celerity, will often be too violent and unmanageable, and will so endanger the patient as not to justify its use unless under very peculiar circumstances. I once prescribed colchicum in large doses in a case of hæmoptysis, with violent paroxysms of cough and threatened abortion, occurring in a plethoric lady at the fourth month of pregnancy. Full venæsection was performed, chiefly on account of the severity of the pulmonary disease; the colchicum was directed with an anodyne; and the patient left under the care of the family practitioner. Abortion took place, and was attributed chiefly to the sickness, retching, and depression occasioned by the colchicum; it having been unremittingly administered until my next visit, on the third day from that on which it had been prescribed, notwithstanding the discretionary power with which the practitioner had been invested. (See also, on this subject, the *Treatment* of Hæmorrhage from the Uterus.)

39. III. The *remedial treatment* of abortions is next to be considered. It occasionally happens that the retention of the ovum, or of a portion of the appendages of the embryo, produces much constitutional disturbance, particularly nervous symptoms and irritative fever, which sometimes assume serious features, with disorder of the bowels, typhoid or ataxic signs, and an offensive vaginal discharge. The decoction of cinchona and muriatic acid, or this decoction with the liquor of the acetate of ammonia, or the following, will prove extremely serviceable: —

No. 1. ℞ Mist. Camphoræ ℥j.; Liq. Ammon. Acet. ʒijss.; Acidi Acetici Pyrolignei ♏xxv.; Syrup. Zingiberis. ʒss. M. Fiat haustus ter quaterve in die sumendus.

No. 2. ℞ Camphoræ rasæ, gr. ij.—iij.; Extr. Cinchon. Resin. gr. iij.—v.; Conserv. Ros. q. s. ut fiant Pilulæ ij., ter die capiendæ.

In cases of this description a turpentine enema, administered every second or third day, is extremely beneficial: and advantage will be derived from injections of a solution of the chloruret of lime, or of Labarraque's liquor, *per vaginam*.

No. 3. ℞ Liq. Labarraquii Chloro-Sod. ʒjss.; Mist. Camphoræ, ℥vijss. M. Fiat injectio.

40. When troublesome diarrhœa is present, in cases of this description, the chloruret of lime, either in the form of pill or solution, is extremely efficacious. I have prescribed it as follows: —

No. 4. ℞ Chlorureti Calcis gr. viij.—xvij.; Pulv. Tragacanth. Comp. ʒjss.; Syrup. q. s. M. Fiant Pilulæ xxiv., quarum capiat binas ter quaterve in die.

No. 5. ℞ Chlorureti Calcis gr. vj.—xij.; Tinct. Calumbæ ʒiij.; Aq. Menth. Virid., vel Aq. Carui, vel Aq. Anethi, ℥vj.—℥vijss. Fiat Mist., cujus sumat coch. j. vel ij. larga ter quaterve quotidiè.

The chloruret of lime may also be administered in water gruel, as an enema, in doses of viij. to xij. grains, once or twice daily.

41. The debility occasioned by abortions require the use of tonics, with mineral acids, nourishing but light diet, a wholesome air, gentle exercise, and the tepid or cold salt-water bath: — the mineral waters of Bath, Barèges, or Tunbridge; those of Ems, Spa, Pyrmont, and Geilnau; or the artificial mineral waters of the last-named places, are also beneficial. When nervous or hysterical symptoms supervene, the exhibition of antispasmodics, with gentle tonics, and the occasional use of cooling aperients, are required. The treatment of the effects of abortion is, in every respect, the same as that recommended in

the articles on *Hæmorrhage* from the *Uterus*, in the unimpregnated and puerperal states.

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ABSCESS. Syn. *Abscessus* (from *abscedere*, to depart, to separate), *Apostema*, *Abscessio*, *Vomica*, *Imposthuma*, Auct. Lat. Αποστημα, Gr. *Abcès*, Fr. *Die Eiterbeule*, Ger. *Edderbyld*, Dan. *Bulning*, Swed. *Ettergezwel*, Dut. *Ascesso*, Ital. *Abscesso*, Span. *Abscesso*, Port. *Abscess*, *Imposthume*, Eng.

Classif. — See Inflammation.

1. Defin. *A collection of purulent matter formed or deposited in the structure of an organ or part.*

2. An abscess is never an original disease, but is constantly the effect or termination of inflammatory action, in some form or grade, or of irritation of the part in which it is seated. This may not seem to be in accordance with certain phenomena connected with the formation of purulent collections, in parts at a distance from those in which inflammatory action originates, and where pus is originally formed: but I shall have occasion to show that it is not opposed to sound views as to this topic, or, at least, that the exceptions to it are few.

3. Without noticing further than to enumerate them, the older distinctions of abscesses into the warm, phlegmonous, or inflammatory, the cold or congestive, and the acute and the chronic, I shall have to show that, instead of proceeding from different sources, they are equally the result of a certain state of inflammatory action, modified into a variety of forms according to the degrees of vital energy and action of the part, and of the system generally, the organisation of the part affected, and the peculiarity of constitution and diathesis. In the present article, a general view will be taken of the *pathology* and *medical treatment* of abscess, the consideration of the different kinds of abscess; their various seats, and relations to other diseases, fall under different heads, where they are more advantageously discussed.

4. I. Of the Pathological Characters of Abscess. 1st, *Of abscess proceeding from acute inflammation, with integrity of the constitutional energy.* When a part becomes inflamed, the vitality of which has not been previously injured, as respects either its individual state or constitutional relations, its temperature becomes increased, and its vessels are injected with a greater quantity of the circulating fluid than in health, and generally in proportion to the violence of the irritation upon which this afflux of fluid depends. At first the fluid does not extend beyond the vessels in which it has passed: but, in proportion as it distends them so as to exhaust their tone and power of reaction, and as the vital cohesion of their extremities, and of the tissues which they supply, is weakened, a portion of the more fluid constituents of their contents escapes into the texture of the part affected; infiltrates, and combines with, its constituent elements; and renders it, at first, more compact and dense. But, at the same time that the inflamed part undergoes this change, it loses its vital elasticity, is more friable or lacerable, so as to break down more readily from foreign pressure, or upon the application of a firm ligature.

5. If the inflammatory action stops not here, the tissues affected by it undergo further changes. They pass, more or less rapidly, from a dense but friable state to that of softening; and this quickly but insensibly assumes a pulpy condition, owing to its continued and increasing infiltration with the more fluid parts of the blood, and even with more or less of its colouring particles; the molecules composing the tissues of the part being so combined with, and separated by, the infiltrated fluid, that all distinct traces of proper organisation are lost. From this pulpy state, to which the central portion of the inflamed structure is reduced, the transition to pus proceeds rapidly. But it is not to be understood that the tissues themselves are converted into this fluid. The fluid poured out from the extreme capillaries gradually distends the surrounding parts, and partially dissolves the softened and disorganised tissues in which it is effused. The coagulable lymph, which the tonic or unexhaused vital energy of the adjoining vessels form in the surrounding texture, confines the effused fluid, and prevents it from extending beyond the barrier it opposes; whilst the impaction of the cellular tissue, occasioned by the increasing quantity of purulent effusion, and the pressure it produces in all directions, with the thickening, and the continued deposition of lymph in the parietes of the abscess, tend still further to fulfil this end, and thus to limit the mischief, and to prevent the contamination and disorganisation of the adjoining structures; consequences which not unfrequently supervene, when the vital energies of the frame and the state of local action are insufficient to admit of the formation of coagulable lymph, and to throw up this barrier against the extension of disease.

6. The first step of the suppurative process is the dissemination, particularly in the softest, in the first and most intensely inflamed part, of minute collections of a sero-albuminous or sero-sanguineous matter. By degrees, this fluid becomes more abundant. These minute collections enlarge, approach each other, and, at last, the partitions of softened tissue between them are altogether disorganised and disappear; the whole, at last, forming only one cavity of variable extent. As this process advances, the effused fluid changes from a thin albuminous lymph into pus; which becomes more thoroughly elaborated, losing its colouring matter which it had derived from the blood, and dissolving the shreds or *débris* of the disorganised tissues in which it had formed: and when the suppurative process is matured, the pus forms an homogeneous fluid, presenting certain characters distinguishing it from all other animal fluids,

7. *Pus,* taken from a matured abscess of the description now exhibited, is generally a whitish or cream-like fluid; friable, homogeneous, soft, and smooth to the touch; somewhat heavier than water, in which it is only partially soluble; without any disagreeable smell, and producing of itself no irritating effects upon the tissues enclosing it as long as it is excluded from the action of the atmosphere. Upon a closer examination, it is found to consist of minute colourless globules, resembling the colourless globules found in the blood, floating in a thin albuminous fluid.

8. It is often a matter of importance to distinguish *pus* from the *mucus* secreted by a mucous membrane in a state of irritation; and, accordingly, various attempts have been made to establish some specific character. The circumstance of pus sinking in and partially mixing with water, whilst mucus remains at its surface, has been taken as a common test; and in many cases will be sufficient, with the history of the disease, and various concomitant phenomena, to enable us to decide: but it should be recollected that the mucus, which is frequently secreted in great abundance by the internal surface of the bladder, and which is very remote from pus in its characters, always sinks in water. Besides, mucous surfaces, when in a state of inflammation, secrete a fluid varying from a thin watery or frothy matter; and in some cases, from a thick albuminous and viscous mucus to a friable cream-like pus: but most commonly, a muco-purulent liquid, which presents more or less of the characters of both pus and mucus. The appearance exhibited by pus, when pressed between two plates of glass, which are afterwards separated, is often distinctive: this fluid attaching itself to their surfaces, without the viscous adhesion of mucus, and partly consisting of small globules. The viscous elasticity of mucus, of which character pus is entirely deprived, distinguishes the one from the other more completely, and in a more intelligible manner, to the practised eye, than any other feature they present. In addition, however, to this, it may be added that, when water is added to a solution of pus in dilute sulphuric acid, a more or less abundant precipitate is formed; whilst, with a solution of mucus in the same acid, whitish filaments form on the surface upon the addition of water.

9. As the partitions of softened tissue placed between the incipient purulent collections, in a part undergoing the early process of suppuration, lose their vitality, and become broken down in the effused fluid, the vessels and nerves, as well as the more solid tissues passing through the part, continue to resist the disorganising process for a longer period, so as to form isolated bridles, and communications between the separated parietes of the abscess.

10. The interior of the *parietes* of the cavity is generally more or less reddened, tomentous, and very close in its texture, owing to the impaction or distending power exercised by the accumulated fluid and the effusion of lymph; so that the fluid contained by them is completely isolated from the surrounding structures. The *membrane* thus formed presents all the characters of a mucous surface, particularly when the greyish pellicle which usually covers it is removed. Its interior surface is in contact with the purulent collection; whilst, externally, it adheres intimately to the surrounding tissues, and is confounded insensibly with them. It approaches more nearly to the circumference of the inflamed part, the more complete the softening of the tissues, and the more the abscess has advanced to maturity. Its density and thickness are generally in proportion to the slowness of its formation and the length of time it has existed.

11. In parts abundantly supplied with cellular tissue, the membrane proper to abscesses acquires a great degree of resistance and density, forming thick *cysts;* whilst in very soft organs, or in those but scantily provided with cellular tissue, as in the brain, it remains long in the state of a vascular pellicle, scarcely distinct from the healthy structure with which it is connected. It is in general rare that we find a thick or firm cyst in the acute abscess now under consideration; for it forms too rapidly to admit of the thickening and condensation usually occasioned by inflammatory action of some duration. In some very acute abscesses, as in those which sometimes form in the liver of Europeans residing in India, after intense inflammation of the internal structure of the organ, no cyst, membrane, or even pellicle can be detected on the internal parietes of the abscess; the whole surrounding structure being inflamed, softened, and sometimes portions of it hanging or floating in shreds in the midst of the purulent collection. In these cases the purulent collection, although existing as a circumscribed abscess, more nearly approaches the diffused abscess next to be noticed.

12. The functions of the membrane lining abscesses are not confined to the containing and isolating the purulent matter, so as to prevent the contamination of the adjoining structures. Owing to the absorption and exhalation proceeding in its surface, the contained fluid is continually renewed, its qualities are modified, and its decomposition prevented. It is not altogether removed from the influence of life, but participates in the vitality of the surrounding textures, as all fluids accumulated in organised parts do, though in a feeble and obscure degree. M. DUPUYTREN remarks, that it is through the medium of this living envelope that the matter contained in abscesses is augmented and diminished in quantity; is thickened, or rendered more fluid; or is occasionally changed by substances absorbed or injected into the circulation. It is because the cysts of abscesses are connected by an intimate sympathy with the chief centres of vitality that the excitation of the more important viscera affects them in so marked a manner; and that remedies, judiciously applied to these viscera, often tend to promote the absorption of the matter they contain.

13. 2d. *Of Abscesses proceeding from acute inflammation in a cachectic habit of body, deficient vital resistance, and with a tendency to spread; or Diffuse Abscess.* In debilitated and vitiated habits of body; in persons of exhausted vital energy, whose assimilating and secreting organs are torpid; and owing to the operation of certain noxious and intense causes, particularly those which contaminate the structure to which they are applied, as various animal poisons, animal and vegetable matter in a state of decomposition, or whatever produces, from its local or constitutional action, a septic effect upon the living textures: from these circumstances especially, inflammatory action is

not limited to a particular part, or within distinct bounds; and the fluid which is poured out from the inflamed vessels is not circumscribed, or confined to the centre of the inflamed part. The inflammation which produces this unhealthy and imperfect form of abscess is always characterised by that state of asthenic or ataxic action, local and general, which is incapable of producing coagulable lymph from the blood, that may limit both the morbid action and the effused fluid. (See art. Inflammation.)

14. The present kind of abscess not unfrequently forms in erysipelas; or after wounds, injuries, and punctures; and from the inoculation of an animal poison. The character of the succession of morbid actions it presents is want of vital power and resistance, and a speedy solution of the vital cohesion of the affected tissues. It would seem that the influence of the ganglial nerves supplying the capillaries of the part is rapidly, or almost instantly, destroyed by the cause of the disease; and that the vessels, thus deprived of a great proportion or the whole of their vitality, allow the escape of the more fluid parts of the blood, and the infiltration of the tissues. The vessels pass rapidly, and without the previous grades of healthy inflammation, into that state which admits of the effusion of a watery or puriform sanies. The state of vital energy, and the deficient crasis, or unhealthy condition of the blood itself, probably contributes to this result; and, with the effect of this effusion on the diseased part, promotes the rapid exhaustion of the remaining action of the capillaries.

15. Diffusive abscesses generally commence in, and spread rapidly in the direction of, the cellular tissue. They affect also, in a very marked manner, the other structures placed in their way. They seldom commence in the internal viscera, as the liver, lungs, &c.; but when they do thus originate, as is occasionally observed in the latter stages of malignant or ataxic fevers, in exhausted states of the frame, &c., they nearly approach the characters they assume in the cellular structure. In almost every case of this disease, the constitutional disturbance is very remarkable; and the powers of the nervous system, particularly that presiding over the organic and assimilating functions, uncommonly depressed. Locally, the effusion of a watery, or sero-albuminous, or a sero-sanguineous fluid is nearly coeval with the affection of the cellular tissue and congestion of its capillaries. The vital cohesion of the inflamed texture is rapidly dissolved; and the fluid, abundantly poured out in its areolæ or cellules, distends the part, diminishes its vital functions to the lowest grade, and, at points, lacerates its tissue, thereby partially cutting off its connection with the adjoining structures. Thus the fluid is effused from the congested capillaries of the affected part in numerous places: in some, forming considerable collections; in others, mere infiltrations. Parts of the cellular tissue itself, and, in rare instances, as the mischief proceeds, portions of adjoining or intermediate textures, are deprived of all vitality, sphacelate, and mix with the fluid effused.

16. In many cases the integuments participate but imperfectly, and often not at all, in the morbid actions, whilst the process, as now described, is going forward; and the great effusion into, and partial destruction of, the cellular tissue, have enormously distended the limb or part in a diffused manner and to a great extent, and given it a boggy or imperfectly fluctuating character. At a later period, parts of the more attenuated or discoloured integuments vesicate, ultimately burst, and give issue at first to a discoloured puriform secretion, which afterwards becomes offensive and otherwise modified. When the skin is affected, it generally presents a dark or livid hue: its temperature is seldom above (excepting, sometimes, at the very commencement of the antecedent inflammation), and frequently sinks below, the natural standard.

17. With respect to the appearance of the secretion in this form of abscess, I may state, that it not only varies remarkably in different cases, but also at different stages of the same case. At first, the fluid effused and infiltrating the cellular structure consists chiefly of a limpid, reddened serum, which readily flows from the divided structures; in a more advanced stage, the effused matter is less fluid, often high-coloured, but without the whiteness and opacity of purulent matter. Afterwards, the cellular membrane is engorged with a white semi-fluid matter, which separates the particles of fat and cellular tissue at an unusual distance from each other. In subsequent stages it continues opaque; but often becomes reddish, greenish, and more fluid. At a still more advanced period, the infiltrated cellular and adipose tissue are entirely broken down, and the sphacelated portions hanging into, or mixed with, the puriform matter; which sometimes now presents the appearance of a brownish, purulent sanies, sometimes a greenish pus, and at other times a sero-purulent matter of various shades of colour and degrees of consistence. At no period of the disease is the matter contained in any circumscribed cavity, but is gradually and irregularly lost in the surrounding cellular tissue; without any demarcation, or appearance of coagulable lymph about the circumference of the diseased part. In general, the purulent secretion speedily assumes an offensive odour, and its sensible qualities are otherwise altered, and often variously, upon the admission of air to the diseased surface.

18. The muscular structure, and other parts in contact with the puriform matter, and in the way of the spreading disease, is generally much discoloured, softened, easily torn, and sometimes partially destroyed. In some cases the muscles are paler; in others, darker, and more livid than natural. In rarer instances, the adjoining bones and more resistant structures are also affected. (See Inflammation, *Diffusive*.)

19. 3d. *Abscesses consequent upon inflammation of lower grades of intensity.* — The more slow and obscure the progress of inflammation, the less marked are the signs of irritation preceding and accompanying abscesses. It is not uncommon to observe, in lymphatic and phlegmatic temperaments, fluctuating tumours of various sizes, both superficial and deep-seated; without any considerable pain or increase of animal heat, either antecedent or subsequent to their formation. Purulent collections, of a chronic and indolent character, generally proceed from a low but continued state of irritation, or from reiterated excitation of so low a grade as scarcely to influence the sensibility of the part; and occur in constitutions of weak vital

resistance and defective restorative energy. On the other hand, the abscesses described in the preceding sections result from inflammation of a more or less acute character, occasioned by active stimulation or deleterious agents, and generally affect the system in a more or less active manner.

20. Owing to the low grade of irritation in the affected part, the vessels are but little, and often scarcely perceptibly, injected. The abscess, in place of commencing with a number of distinct centres or foci, appears at first as a single isolated collection in one or more of the cellular areolæ, and presenting, from the commencement, a manifest fluctuation. In some cases, this appearance of the affected part is less that of true phlogosis than of a deviation from its nutritive actions. The tissues, instead of attracting, in virtue of their vital endowment, the nutritive particles; and the vessels, instead of imparting them in an appropriate condition, and exhaling a fluid suitable to the healthy state of parts, are so far changed as to fail in the performance of these actions; the vessels furnishing a fluid of a certain kind, apparently composed of the particles or globules which, under the influence of healthy vital endowment, would have been separated from the circulating fluid for the nourishment or growth of the tissues, and of the watery exhalation destined to lubricate them, and render them fitted for their functions.

21. In the chronic varieties of abscess, the *pus*, being secreted under the influence of a lower grade of excitation, differs from that previously described (§ 7, 8.). It is frequently yellowish, serous, transparent; containing flocculi of an albuminous or fibrinous nature, and whitish, opaque appearance: sometimes it is mixed with minute shreds of cellular-like substances. In other cases it is nearly analogous to mucus, from its thickness and viscosity. In some subjects, when very slow in its formation, it assumes a greater consistence and opacity, resembling half-congealed lard or liquid honey; and the tumours which it forms seem to constitute a connecting chain between pure abscesses and melicerous or steatomatous cysts. These latter differ in no respects from abscesses devoid of active inflammation, but in the greater consistence of the matter they contain: and in some cases, as M. Dupuytren remarks, it is difficult, if not impossible, to distinguish between them.

22. Owing to the extreme slowness of their formation, and the absence of acute inflammatory action, the *parietes* of the present kind of abscess have a more distinct organisation than those of the first species. Vascular injection and redness are here seldom observed exteriorly to the *cyst* enclosing the purulent collection. The skin covering the tumour, and through which the fluctuation is readily felt, is generally free, moveable, and unaltered. All the morbid action seems concentrated in the diseased membrane enclosing the matter. This membrane or cyst is, internally, of a reddish grey tint, and more or less intimately connected with the surrounding structure. It is in some cases soft, thin, and cellular; in others, thick, strong, and of a cellulo-fibrous, or even fibrous structure. The slower the tumour is in enlarging, the more liable is the cyst to undergo change, and to modify the state of the matter it contains: and, hence, abscesses of a very slow or chronic kind often approach slowly but nearly to the characters of several other encysted tumours.

23. The purulent collections which form around foreign bodies, that occasion but little irritation, generally belong to the present kind of abscesses. They are always lined with a firm cellular cyst, analogous to that enclosing the foreign body itself. The abscesses which proceed from bodies occasioning great irritation are preceded by great pain and inflammation, and belong to the preceding kind of abscess.

24. 4th. *Of symptomatic abscesses, or collections of matter at a distance from the places where the pus is first formed.* In the foregoing sections I have considered the formation of abscesses in, and their limitation to, the primary seat of irritation: but if the parts affected are surrounded by a loose areolar cellular tissue, readily permeable by the matter as it is formed; and especially if the state of vascular action and vital energy of the frame are insufficient tot he production of coagulable lymph around the inflamed centre; the matter gradually finds its way in the course of the cellular structure to adjoining parts, particularly to those which are more dependent, infiltrates them, and forms, more or less distinct and fluctuating, tumours at a distance from the primary seat of inflammation. Instances of this kind of abscess are furnished us in diseases of the hip-joint, and in cases of inflammation commencing in some or one of the vertebræ, or their fibro-cartilages. In this latter case, if the disease commences in one of the dorsal vertebræ, the purulent fluid may accumulate under the pleura, infiltrate the adjoining cellular tissue, and, following the direction of the ribs, appear at some part of the side or back, or even near the sternum, far from its origin. When the inflammation attacks one of the dorsal or lumbar vertebræ, or intervertebral structures, it may travel in a similar manner behind the pillars of the diaphragm, proceed in the course of the psoæ and iliac muscles, following the cellular tissue behind the peritoneum, and appear exteriorly, most frequently under the crural arch, but sometimes through the inguinal ring. In other cases it proceeds to a shorter distance, and points at the sacro-iliac symphysis, or in the angle between it and the spine: or it may extend down the pelvis in various directions, following the cellular substance surrounding the vessels and nerves. Thus it may pass through the ischiatic notch, forming an abscess at the internal part of the gluteal muscles; or along with the great sciatic nerve, and point on the superior and posterior part of the thigh; and, lastly, it may find an issue in the perineum, at the margin of the anus, or into the rectum, or even into the vagina. In some rare instances a double tumour and opening are formed. In the case of a female by whom I was consulted, the matter had found its way to the integuments of the sacro-spinal angle of the loins, where it was punctured by a surgeon, and yet had also burst its way into the vagina. In the case of a groom whom I attended, a tumour formed at the sacro-iliac symphysis, below the crural arch, producing the most violent and painful tumefaction of the limb, owing to the pressure of the matter on the nerves and veins; and the matter afterwards burst into the lower part of the sigmoid flexure of the colon.

25. The matter proceeding from abscesses symp-

tomatic of inflammation and ulceration of bones or cartilages is generally greyish, thin, mixed with albuminous flocculi, minute clots of blood, and portions of phosphate of lime. It exhales a nauseous odour: but this characteristic is present only after the opening of the tumour, and when the air has access to the cavity.

26. If we examine the cavities of symptomatic abscesses, and trace them from their origin to their outlet, we shall find, in the former situation, the cartilages and bones profoundly changed: the bones are softened, friable, changed to a greyish black, partially absorbed and carious, and their periosteum destroyed. From this origin of the disease is formed a channel or sinus, traversing the cellular structure frequently in the course of the large vessels or muscles, and terminating with the external outlet of the tumour. The whole of this canal or sinus is usually surrounded by a softened, friable, or lardaceous state of the textures; and lined with a smooth, thick, firm, cellular, or fibro-cellular membrane, which in some cases is of a fibro-cartilaginous structure. At the lower part, the canal generally dilates into a considerable cavity, sometimes irregular or sinuous in its form, and lined with the membrane usually found in the more chronic kinds of abscesses.

27. 4th. *Of consecutive abscesses; or collections of matter found in situations consecutively to its formation in distant parts, between which there exists no communication.* It has been not infrequently remarked, that inflammation of a part has taken place, and has gone on to suppuration; that the matter thus formed has been absorbed; and that it has subsequently formed in some other viscus, generally in an internal organ. The nature and procession of the morbid phenomena now enounced have led to some enquiry, particularly in recent times. The circumstances in which consecutive abscesses occur in practice are the following: —

Inflammation of the internal surface of the uterus, or of its veins, or of both the substance of the uterus and veins, occasionally takes place after child-birth, and terminates the life of the patient. On dissection, purulent infiltrations or distinct collections of pus are found, in one case, in the lungs; in another, in the liver; in a third, in the substance of the brain; in a fourth, in the capsules of the joints; and, in a fifth, in both the lungs, liver, and perhaps, also, in the joints. A man, from injury of the head, has inflammation of the sinuses of the brain, followed by all the symptoms of a vitiated state of the circulating fluid, terminating in death: after which, abscesses, or purulent infiltrations, are found in the liver or lungs. A similar procession of phenomena occasionally results from phlebitis consequent on blood-letting, or other causes; also during the suppurations following amputations, particularly when the matter is confined on the face of the stump, by the adhesion of the integuments which had been drawn over it. A child is seized with severe or confluent small-pox; and during, or subsequently to, the secondary fever, fluctuating tumours form in the joints from matter accumulated in their capsules. Upon dissection, the cartilages are found eroded; and, in other rare cases of this kind, purulent collections are found in the internal viscera. In other instances, abscess disappears from external parts; the patient sinks with low fever; and, upon dissection, collections of pus are found in internal organs. In cases of this description, the following require notice: — 1st, The state of the vital energies preceding or during the occurrence; 2d, The symptoms characterising the progress of the phenomena; and, 3d, The nature of the results.

28. 1st, The energies and vital resistance of the system are generally greatly impaired, either from pre-existing or concurring causes, in cases where consecutive abscesses form. (See article on *Inflammation of* VEINS.) 2d, The depression of the powers of life increases as the disease advances. The nervous system is seriously affected; the circulating fluid betrays change in its appearances after its emission, or after death; the soft solids lose their vital elasticity and cohesion; the surface of the body and countenance become dusky and livid; and low delirium, rapid and weak circulation, &c. take place. 3d, The purulent matter is generally either infiltrated into the parenchymatous structure of some organ, or collected into one or more distinct abscesses, or it is effused into the cavity of one or more joints. When the matter is infiltrated into the texture of an organ, the infiltrated structure is very frequently also softened. The purulent collections that are found in other cases generally have no distinct cyst, and the surrounding substance of the organ seldom presents any marked redness or injection of its vessels, or indeed any remarkable change, excepting in some instances a slight softening. The matter is usually found in several distinct abscesses or collections, varying from the size of a small seed to that of an egg, or even larger. Sometimes the immediately surrounding structure seems impacted around the abscess, but not otherwise changed. The purulent matter itself varies but little from that which is observed in the abscesses described in the first section. (§§ 6, 7, 8.) It is occasionally of a darker or greenish hue, particularly when found in the liver.

29. As to the *Origin* of these purulent collections, some doubts may be entertained. That they are very intimately connected with the primary inflammation and formation of matter in other parts of the system, cannot be doubted, but in what way cannot be so readily stated. It seems to me extremely probable, from the attentive observation of the progress of a number of such cases which have come before me in practice, that, owing to depressed vital energy, and deficient resistance of the frame, purulent matter passes into and vitiates the blood; that the morbid condition of the circulating fluid, thus induced, depresses still lower the already weakened nervous powers; and that the irritating matters carried into the circulating current change the state of the capillaries of parenchymatous and some other organs, so that they secrete purulent matter without any evident sign of previous or accompanying inflammation. Several French pathologists suppose that the purulent matter conveyed into the blood circulates without combining with it, and is merely deposited by the capillaries, or separated by them, from this fluid in parts; the vessels and texture of which are most disposed to permit its elimination, or the best constituted to admit of its deposition. It is difficult to determine in which of those ways the consecutive abscess is formed. Indeed, both may approximate

the truth, the consecutive formation of pus arising, in one case, from the irritation occasioned by the presence of morbid matters in the blood; and, in another, chiefly from the separation or secretion of it in the parenchyma of an organ, without any previous or attendant irritation.

30. II. Of the Progress and Terminations of Abscesses.—At any period of its existence, the inflammatory action in an abscess may cease, and the matter which has been formed be *absorbed*. In these cases the purulent matter is carried into the circulation; and, whether the inflammation is primarily and gradually extinguished in the abscess, or whether intense pain and inflammation, developed in some other organ, exercises on the first centre of mischief a true revulsion, the absorption of the pus is only consequent upon the subsidence of the local signs of inflammation and congestion. The part loses its turgescence, redness, increased heat, and tumefaction, and is restored to its healthy state without any deformity or cicatrix. In these cases the absorbed matter is eliminated from the circulating mass, without accumulating in it to a hurtful extent, by the active or unimpaired functions of the various eliminating organs, particularly by the kidneys, and mucuous surface of the intestinal canal, — the matter, in some cases, being apparent in the urine, and in the others exciting a temporary diarrhœa.

31. In other instances, the inflammation productive of suppuration being but slight, or being less completely dissipated, and the solid tissues, and particularly the firm and thickened cyst, opposing the extension of the abscess, it occasionally rests long stationary. In this case the pus remains inactive and inoffensive in the part, like a smooth and inert body lodged in a cyst. Abscesses will sometimes continue for a very long time unchanged, and without occasioning much disturbance to the economy, particularly when deeply seated. In such cases the cyst becomes more and more firmly constituted, thickened, and changed from the state of the surrounding parts; so that the pus is in some measure isolated from the adjoining structures: in this state it may remain, as in the brain and liver, for a considerable time, without any very marked symptoms, until some accident or exciting cause occurs to affect it and the adjoining parts, when the usual course of the disease will be resumed.

32. The foregoing changes are comparatively rare. In the great majority of cases, pus distends, compresses, and obscurely excites, the parts in which it is lodged. Instead of being diminished, the abscess is increased in size, and tends to find an external outlet, uniformly in the direction of either the cutaneous or one of the mucous surfaces. Purulent matter is thus submitted to the general law of the economy; the vital resistance, opposed to all substances calculated to excite or otherwise injure the textures, detruding it by a regular procession of phenomena, as long as the energies of the system are not entirely overwhelmed, to the nearest or most unresisting part of the surface, and at last expelling it altogether from the body.

33. The succession of morbid phenomena occasioning the deliverance of the system from collections of matter, is of great importance to the practitioner, particularly as respects deep-seated or internal abscesses. Generally the quantity of matter is continually increasing, owing either to the extension of suppuration in the inflamed part, or to a continued secretion from the internal surface of the abscess, or to the concurrent operation of both causes. In consequence of this increase of quantity, the parietes of the abscess are distended and applied more closely to the surrounding parts, which are pressed outwards by the accumulated matter. This distending power is equally exercised from the centre to the circumference. But, as all the adjoining parts do not exercise the same degree of resistance, the abscess extends in the direction of the external or free surfaces; its more deeply seated parietes being sustained by all those parts which are placed beneath them; whilst the tissues which are exterior to it, being deprived of aid, are readily elevated and distended by the increased effusion.

34. As to the nature of this effusion, and the changes it undergoes, certain questions have been urged. It has been supposed that the matter found in abscesses is not secreted in the state in which it exists at the period of maturation: but that the fluid effused is in a state which may be called albuminous serum; which, owing to the continued exhalation and absorption taking place in the internal surface of the abscess, is changed into what is called well-digested pus. Others suppose that the purulent fluid is secreted in the state of pus, or nearly approaching to it, by the membrane forming the cyst, and which, as it presents many of the characters of mucous membrane, may, like this membrane, when highly inflamed, secrete a purulent fluid. It is extremely probable that both views may be in a great measure correct: for attention to the maturative process in recent abscesses shows that the fluid first effused is not pure pus; and it is undeniably proved that the matter contained in the different kinds of abscesses is variously modified according to their duration, their situation, and the circumstances attendant on their progress. Whilst, on the other hand, it must be conceded that the internal surface of an abscess, particularly in a high state of inflammation, or when irritated by the contact of the air, will secrete a purulent fluid, or a matter which very rapidly assumes the puriform character; the vessels terminating in it giving issue not only to the watery part of the blood, but also to many of its smaller globules, so as readily to form a pure pus, which quickly becomes thick, upon the evaporation or absorption of a portion of its more fluid constituents.

35. Another important matter, relative to the progress and external pointing of abscesses, is the fact, that inflammation generally seizes upon the adjoining structures as the internal membrane is more closely applied to them. The parts most distended and stretched by the contained fluid have the inflammatory action extended to them from the parietes or membrane of the abscess. To the inflammatory irritation thus induced in the surrounding textures succeed their adhesion to the parietes of the abscess; absorption of their solid elements, with attenuation; and, lastly, ulceration,—the integuments merely often resisting for a considerable period the discharge of the fluid.

36. If we take as an example the not unfrequent occurrence of abscess in the substance of the liver, and trace its progress in one of those

directions which it sometimes follows, namely, through the diaphragm and lungs, until it empties itself into the bronchi, we shall find the following to be the course of the morbid phenomena:—As the inflammatory action and the secretion of purulent matter proceed, the abscess which has been formed, generally in cases of this kind in the convex part of the organ, advances towards the surface; the inflammatory action extends to this part; and lymph is thrown out, which, with the pressure of the swelling and pointing of the abscess, irritates the peritoneal surface of the diaphragm, inflames it at the part opposite, and occasions its agglutination at this situation to the parietes of the hepatic abscess. As the tumour points upwards, the inflammatory action advances in the same direction; extends to the muscular structure of the diaphragm, which is softened and attenuated, assuming at the same time a dark or bluish tint; and invades the diaphragmatic pleura, where it throws out coagulable lymph. This secretion occasions irritation and inflammation in the opposite part of the pulmonary pleura, and the cohesion of the lung to the diaphragm at the part where the collected matter is advancing prominently upwards. As the parts thus successively involved undergo the softening process consequent on inflammation, and yield before the pressure of the accumulated fluid, owing to their diminished vital cohesion, absorption commences and proceeds in the central or prominent part of the tumour; and the matter thus finds its way in the direction which is most yielding, where the inflammatory action most readily advances, and where the resistance to it is thereby still further diminished. I have had frequent occasion to trace the above phases of the progress of large and deep-seated abscesses; and to satisfy myself that they proceed in a similar manner, whether they advance to the external surface of the body, or open upon a mucous surface, or into a shut cavity; which last is a rare occurrence.

37. It is of importance to observe the procession of phenomena now stated; inasmuch as the successive reddening, inflammation, adhesion, softening, and absorption of the various structures, as the tumour advances exteriorly, are the guides to a very important part of the treatment of these formations. Thus, when we observe marks of inflammatory irritation of the skin take place in the situation of an internal abscess, we may infer that the ulterior phenomena now enumerated, particularly adhesion, have taken place in the parts beneath, and we may safely decide upon carrying an incision from the centre of the inflamed integuments to the seat of abscess.

38. It must not be overlooked, that various aberrations of purulent collections take place, in their progress to the surface, and that they often proceed in a direction opposite to that of gravitation, owing to the resistance of bones, fasciæ, and aponeuroses; which last oppose them in a most remarkable manner, and cause their extension in various directions, giving rise to the most severe local and constitutional sufferings.

39. Abscesses, besides, cause the inflammation of parts placed between them and the centre of the system, as respects the direction of the circulating vessels, as well as of those parts situated exteriorly to them, although in a much less degree, and followed by very different results; for, instead of the thinning, erosion, and ulceration of the exterior parts, tending to advance them to the surface, the inflammation of the parts behind, or more deeply seated than they, is frequently accompanied with thickening, and increased density of structure; whereby the system is, in a great measure, protected from their extension to more internal and vital parts. Numerous instances occur, where the periosteum or the peritoneum, the pleura, the fibrous and synovial capsules, undergo a marked thickening, opposing thereby an increased obstacle to their extension in that direction, when abscesses form in the vicinity of those membranes. When, however, the energy of the system and its vital resistance are deficient, exceptions sometimes occur to this rule, and abscesses find their way, when situated favourably to this mode of termination, into important cavities and organs. Thus, an abscess seated deep in the parietes of the chest or abdomen, may open into these cavities, as in the case of the son of the eminent M. Petit; or an abscess in the liver may find its way into the pericardium. But any disposition to its opening internally, is opposed not only by the thickening of the serous and other membranes, &c., as here instanced, but also by the support of the viscera underneath, which resist the pressure and extension of the tumour in this direction.

40. The progress and *spontaneous opening* of abscesses, advancing in the manner now explained, terminate with the erosion of the integuments, which, having been reduced to a pellicle, have their epidermis elevated in the form of a phlyctena, which soon breaks, and gives issue to a portion of the contents of the abscess; and the discharge is renewed at intervals, by the gradual retraction of the parietes of the cavity upon the re-accumulated secretion. The successive evacuations occasioned by the reaction of the parietes of the abscess, are particularly favourable in cases of large abscess, by preventing any vacuity. In cases of empyema, for instance, where the artificial opening is often fatal, a favourable result not unfrequently follows a spontaneous and successive evacuation of the purulous collection: for it is chiefly by imitating the natural process in those cases, that we secure the greatest advantages to the patient, where we find it requisite to open symptomatic abscesses, as those usually called lumbar; and not by making large incisions, and producing a large evacuation, whereby the air has access to their cavities, but by successive punctures, the margins of which are immediately closed, upon the evacuation of that part of the contents which are first expelled by the reaction of their parietes.

41. The passage of air into the cavities of abscesses is always followed by an increased state of irritation of their lining membrane. The hurtful effects of this communication have been demonstrated by M. Dupuytren, and other eminent men, although denied by others, but without either the satisfactory proofs of experience or of reasoning. In some cases the accession of inflammatory action in the part, upon the access of air, is very remarkable. In cases of small chronic abscesses this effect is often beneficial; but in large and acute abscesses the irritation thus induced may be too great for the powers of the system to withstand.

42. Under the most favourable circumstances, the effects of the admission of air into the cavity of an abscess are counteracted by the accompanying treatment; and the discharge soon assumes a different appearance from that of the matter first evacuated: it becomes less white and consistent; and, subsequently, when the parietes commence forming the adhesions which precede cicatrisation, it is merely a more or less copious citron-coloured serosity.

After the opening of slow and indolent abscesses, the serous, thin, and flocculent pus with which they are filled, is replaced by the discharge of a more digested, homogeneous, and cream-like fluid, indicating a more intense state of action in their parietes.

43. Upon examining the interior of abscesses which have been opened, it will be seen that their parietes gradually discharge themselves; that they cast off the grayish and flocculent pellicle which covers them; and that they become covered with cellular and vascular granulations, of a lively red and solid appearance, formed from coagulable lymph thrown on the inflamed surface, into which new capillary vessels shoot, and resembling the granulations on the surface of wounds, from which is exhaled the matter which succeeds to that first discharged from them. The parietes thus cleansed contract towards their centres, and in the direction of their most deeply seated parts. They afterwards unite; so that the cavity, which has been thus circumscribed, at last disappears. In the situation of the abscess nothing is found but its cicatrix; at first consisting of a cellular lamina, or plate, of various thickness and density, penetrated by coagulable lymph, and subsequently converted into a scarcely apparent cellular line, which sometimes, at last, entirely disappears.

44. But the progress of abscesses after they have been opened, is not always so favourable. It may be premised, that the irritation proceeding from the contact of air with the internal surface of an abscess is, in general, in proportion to its volume, and the unyielding state of its parietes. When the abscess is small, the resulting irritation is but faintly marked: but if the parietes be of a large extent, and if the abscess is deeply seated, particularly if it be in any of the viscera, the inflammatory excitement occasioned by the air not only increases all the local phenomena, but also gives rise to serious constitutional disturbance, often terminating the life of the patient. The yielding state of the parietes, and their apposition, are sometimes calculated to counterbalance the bad effects occasioned by their extent. When the diseased surfaces have been freed by the complete discharge of matter, and admit of being closely applied to each other, the admission of air is in a great measure prevented, and adhesions frequently proceed rapidly. Where, however, the parietes cannot be brought closely together, and the cavity can be obliterated only by means of granulations formed to an extent that may fill it, the duration of the suppuration is prolonged, and the effects produced on the constitution by the extent of the discharge are often serious.

45. But this is not all the mischief resulting from the access of air to the cavity of an abscess: the pus which still remains, particularly in deep-seated abscesses, is more or less changed by it, and exhales an infected or putrid odour, proceeding from decomposition occasioned by the temperature to which it is subjected, and its contact with atmospheric air. It is also often observed, that when large abscesses are opened, and air gains access to them, the morbid excitement thereby occasioned in their parietes, re-acts upon the principal vital centres; the nervous systems, the digestive organs, and the circulation suffering from and participating in it, and the suppurative process is thereby greatly increased; at the same time the constitutional powers are much depressed, the matter is rendered much more offensive, and otherwise changed, according to the seat of the abscess. As the powers of life sink under the disease, the fluid secreted is more offensive and disposed to decomposition, until it is often doubtful whether the change proceeds more from the access of air, than from the low state of vital energy. Indeed, in many cases, the latter cause seems much more influential towards producing this state of the discharge than the presence of air; for we not infrequently observe, that as long as the constitutional powers remain but little depressed, the access of air has but little effect, the discharge exhaling no offensive odour; but as soon as, owing either to the increase of inflammation in the cyst, or to other concurrent causes, the febrile commotion is increased, and the nervous system and digestive organs evince serious disturbance and loss of energy, the discharge becomes rapidly offensive and increased in quantity; the matter often changing from a more or less pure pus to a state approaching to putrid sanies.

46. III. OF THE DIAGNOSTIC SIGNS OF ABSCESS. When inflammation has attacked a cellular structure, or viscus, in which this tissue is a prominent constituent part, and particularly if it be intense in degree, rapid in its progress, and accompanied with a pulsative pain, we may with confidence decide upon suppuration being about to take place. This result is announced by a diminution of the pain, which changes to a pulsatory sensation isochronous with the pulse; by a feeling of weight and tension in the part; by a diminution of the febrile action, succeeded by a large, broad, open, soft, or undulating pulse; and by irregular chills or rigors, which extend, after various intervals, along the back, loins, and sometimes the lower extremities. If the matter is not soon afterwards evacuated, the symptoms of chronic irritation succeed; especially small and frequent pulse, heat or burning of the palms of the hands and soles of the feet; irregular fits of perspiration, and night sweats; loss of strength; and all the characteristics of hectic fever, which makes more or less rapid progress, and is sooner or later followed by colliquative diarrhœa, according to the seat and extent of the abscess, the constitutional powers of the patient, and the treatment employed. The above symptoms indicate that a permanent cause of irritation, and of constitutional contamination, has succeeded to the state of active inflammation.

47. The tumefied state which characterises sthenic or phlegmonous inflammation, is greatly modified after suppuration has advanced. It becomes less diffused, is much lessened in the circumference of the periphery of the tumour, and seems more and more concentrated. Hence it

becomes more elevated, prominent, and softened at the centre of the surface. The redness and tension undergo a similar change. The circumference of the inflamed surface is restored in some degree to the natural state; but the more prominent part acquires a dark red tint, afterwards a bluish hue, and yields more and more to the pressure of the subjacent pus. For some time previous to this stage the tumour evinces a more or less distinct fluctuation when suitably examined, and this sign becomes more manifest as the abscess advances to the surface.

48. When an abscess forms in deep-seated parts or viscera, particularly those protected by solid envelopes, or by thick and unyielding structures, the diagnosis rests entirely upon the nature of the constitutional disturbance, and the disorder in the functions of the affected organ or part, and here the physician should seize and appreciate the slightest difference taking place in the pulse, the animal heat, and the state of all the natural and organic functions. In these cases he requires the most exquisite tact for examination, in order to arrive at an accurate opinion. The symptoms which should guide him in cases of this description will be stated when I treat of the diagnosis of the different kinds of visceral abscess. I may, however, remark at this place, that, even in parts much less deeply seated, when the cyst of an abscess is greatly distended and very tense, fluctuation of its contents are generally extremely obscure, or even not to be felt, although its contents may be very fluid. Also, when the purulent matter is contained in no distinct cyst, but is disseminated through the textures, or infiltrated between fasciæ or muscles, or is confined beneath aponeuroses, great incertitude may exist as to its formation. The parts in such cases present more of a diffused œdema than of a fluctuating tumour; and if fluctuation can be at all felt, it is only obscurely.

49. It must be evident that the more feeble and latent the phenomena of the precursory inflammatory irritation, the more difficult is it to determine the period at which the elaboration of pus commences. We frequently observe in practice, particularly after phlebitis, injuries of the head, fractures, and capital surgical operations, abscesses form in the liver, mediastinum, lungs, kidneys, or ovaries, preceded merely by obscure and occasional pain, and furnishing no certain symptoms of a local kind, by which we can decide as to their formation, until the time that they appear externally, or are detected upon *post mortem* examination. In cases of this description, the constitutional symptons are our chief guides; but even these are often so uncertain and so imperfectly developed as to leave us in doubt. The accession in this obscure manner of internal abscess is particularly remarkable as respects those which supervene to inflammatory disease existing in other parts, particularly to phlebitis, and which I have denominated *consecutive* abscesses. (See Veins — *inflammation of*.)

50. Symptomatic abscesses generally escape detection until they advance externally. Previous to this, pain, uneasiness, tumefaction, &c. are only felt chiefly in the part originally affected. But the symptoms already noticed (§ 46—48.), especially the unhealthy aspect of the surface, the state of the febrile action and of the pulse, the night perspirations, the disorder of the respiratory and alvine functions, will generally serve, in conjunction with the changes in the part to which symptomatic abscesses extend, to indicate the nature of the mischief.

51. It is important, as M. Dupuytren has very justly remarked, to take into account, when determining the existence of abscess, the greater disposition inherent in some constitutions to form purulent matter. In some persons, the least irritation is followed by the suppurative process. This is particularly the case in persons of a pale visage, of a soft flaccid state of the different structures, and of the lymphatic temperament. It is also remarkable in those whose vital energies have been lowered by previous disease; by chronic affections of the digestive mucous surfaces; and by those diseases which require the performance of amputation, or other important surgical operations. When the suppurative process has continued for some time, and has afterwards been suddenly stopped by an operation, or any other active treatment, the disposition to form abscesses is generally remarkable. A similar remark may be extended to the sudden suppression of any accustomed secretion or discharge. The most familiar instance of this kind is noticed in the breasts of nurses, which are extremely liable to suppuration upon interruption to the secretion of milk. These considerations should have their due weight with us when estimating the signs of the existence of internal abscess. Those symptoms which are peculiar to collections of matter formed in each of the internal viscera are pointed out in their respective articles.

52. IV. Of the Prognosis of Abscess. The danger from abscess is in proportion, 1st, to the extent of their internal surface; 2d, to the depth at which they are seated; 3d, to the indolence of their action, or the deficiency of vital action accompanying them; 4th, to the severity and danger of the disease by which they have been occasioned; 5th, to the sinking or deficiency of the constitutional powers under them; and, 6th, to the severity of the symptoms accompanying them, or produced by them. These positions are so obvious, that no remarks need be offered in support of them. I may, however, observe, that abscesses seated in internal viscera are always attended with danger; but the degree of danger will depend upon numerous circumstances connected with their seat, the direction which they take, the state of the vital energies of the frame during their progress, the chances of their evacuation, and the means of reparation and renovation the constitution may still possess.

53. The prognosis of chronic, symptomatic, and consecutive abscesses depends as much upon the nature of the preceding disease, as upon the state of the abscess itself. In chronic abscess, the danger is in proportion to the extent of the surface of its parietes, and to the grade of constitutional vice. In symptomatic abscess, the danger depends almost wholly upon the nature and extent of the original disease, of which it is the consequence, and upon the largeness of surface extending thence to the ultimate limits of suppuration. In consecutive abscess, the danger is extreme; owing, in many cases, to the nature of the primary disease, the depressed state of the constitutional powers, and to the vitiation of the circulating

fluid and soft solids of the body, with which it is connected.

54. V. OF THE MEDICAL TREATMENT OF ABSCESS. — The indications of cure which we propose in abscess is, 1st, to remove the purulent collection from the part containing it; and, 2d, to procure the obliteration of the cavity in which it was lodged. The *first* intention is accomplished either by procuring the absorption of the purulent matter, and its elimination from the body; or by opening the parietes of the abscess, and thus giving a direct outlet to the contained matter. When the means used to accomplish the absorption of the purulent matter fail, or when the character of the abscess and state of the frame forbid the employment of these means, opening the abscess must be resorted to when the proper period for having recourse to the measure arrives.

55. 1st, *Means which may be resorted to, in order to procure the absorption of the purulent matter, and its elimination from the frame.* — Numerous instances have occurred of the rapid absorption of the matter contained in an abscess, and of its discharge from the circulation, 1st, by the urinary organs, the urine becoming abundant, and containing either a puriform secretion, or being otherwise altered; 2d, by the mucous surface of the bowels, attended with diarrhœa; and, 3d, by the cutaneous surface, in the form of a copious, thick, or viscid, and offensive perspiration. These are the most common channels of elimination of the purulent secretion, when absorbed into the circulation from the cavity of an abscess. The purulent collection may, also, disappear in consequence of other critical or accidental evacuations; but this result is of rare occurrence, and is a much more remote contingency than those enumerated. Experience having shown the possibility, and the great advantages, of removing the matter contained in an abscess by exciting absorption, the means most effectual in attaining this end should be first put in practice.

56. With this view drastic purgatives may be prescribed, when the state of the patient admits of them; and next to them, such diuretics and diaphoretics, as may be appropriate to the circumstances of the case. Contemporaneously with the use of those internal derivatives, external applications should be employed, particularly those which possess discutient, resolvent, and styptic properties. Frictions with stimulating substances, as ammoniacum, iodine, hydriodate of potash, &c.; cold, warm, or tepid affusions on the part, either of simple or mineral waters, of sulphureous or saline, natural or artificial, may likewise be tried conjointly with the internal means. But this energetic plan of treatment, — this combination of the revulsive and discutient practice, — this *methodus perturbatrix*, is not applicable to all cases. There are many circumstances connected with the seat and condition of an abscess, and with the state of the different functions, that either altogether forbid its employment, or require important modifications and adaptations of it.

57. Thus, abscesses preceded by acute or active inflammation, are rarely susceptible of being absorbed; the opening of them, therefore, is almost inevitable. Chronic abscesses, which are generally provided with thick cysts, also admit not of removal by this practice; it being generally requisite to excite a new action in their parietes, which may modify their texture, and render them susceptible of contracting the adhesions requisite to their obliteration. The majority of purulent collections which are removed by absorption, is such as form rapidly, without much previous inflammation, and in debilitated habits, or in those weakened by pre-existing disease. In persons of this description, the excitement or irritation of the kidneys, or of the mucous surfaces, will often overcome the irritation existing in the seat of abscess, and consequently promote the absorption of the pus it contains; at the same time that the fluid abundantly secreted by the parts artificially excited will assume, in consequence of the state of the patient, a puriform character. (DUPUYTREN.) But, in the majority of instances of this kind, it is necessary that the artificial irritation or excitement shall be greater than that previously existing in the seat of abscess, and that the organs or parts in which it is induced be in a sound state; otherwise the revulsion cannot be either successfully or safely practised. However we may explain the mode of action of revulsants on abscesses of this kind, there can be no doubt that it is almost entirely in them, and particularly when they are seated in lymphatic glands, that we can hope successfully to employ this plan of cure.

58. When the evacuations procured from the first passages, and from the kidneys and skin, have no effect upon the tumours, and particularly if the stomach and bowels seemed to support their action with difficulty, they must be abandoned, and recourse be had chiefly to the more direct means of cure. The local excitants, as iodine, the sulphureous *douches*, frictions with mercurial, camphorated, and terebinthinated liniments, and the repeated application of blisters for a short time, are only suited to the chronic kinds of abscess, where little or no inflammatory action exists. But these remedies should be watched, lest they increase the heat and inflammatory action of the external or superficial part of the tumour, and thus occasion their external opening.

59. In the majority of abscesses, it is requisite to keep three facts in recollection: 1st, that the inflammatory action in their parietes does not cease on the formation of the purulent collection; 2d, that an abscess is generally a complication of this inflammation, and of the retention of purulent matter in the inflamed parts which formed it, the inflammatory action being still present, although in a somewhat modified state and grade, and still continuing to form this matter; and, 3d, that the existence of pus does not necessarily or materially change the nature of the action which produced it. The therapeutical indications to which these facts necessarily lead are important, particularly as they show, what, indeed, has been proved by experience, that antiphlogistic remedies, especially those of local application, should not be laid aside with the supervention of suppuration. In the majority of cases, and particularly when increased heat of the part still continues, this class of local remedies should be employed with an energy in proportion to the activity of the local symptoms. As long as pain, redness, heat, and tension remain around the abscess, so long should leeches, or other modes of capillary depletion, directed to its vicinity, be had recourse to, particularly if the state of the patient offers no urgent indications against the practice.

Emollient and astringent applications should also be constantly employed. These will generally reduce the inflammation of the surrounding tissue, favour the resolution of the parts not yet suppurated, limit the quantity of the morbid secretion, and favour the maturation of the abscess, so that it may be opened with the best hopes of success. In some cases, the use of these antiphlogistic measures will give rise to the absorption of the purulent matter, even after this had been attempted to no purpose by means of revulsants.

60. It should be recollected that the surfaces of abscesses are the constant seat of two kinds of action; one of exhalation or secretion, the other of absorption; and that whatever excites or irritates them increases the former, and whatever soothes or diminishes this irritation lessens it, and favours the latter action. This consideration should lead us strenuously to adopt a continued antiphlogistic and soothing treatment of the affected part, until the thinning of the skin at the most prominent part of the tumour indicates the necessity of opening it.

61. In symptomatic abscesses, the treatment should chiefly be directed to the primary seat of disease; for as long as the mischief continues or advances there, the purulent collection increases, and diminishes as it subsides. Thus, the abscesses that point near the anus or crural arch, in consequence of disease of the vertebræ, will sometimes disappear after the use of active means directed to the original malady, and judiciously adapted to the state of the patient.

62. Consecutive and spreading abscesses require a very different management from that now pointed out. These generally occur in persons of an unhealthy habit of body, or who have been weakened by acute disease; or they are the result of an adynamic or ataxic and spreading inflammation occasioned by a specific or poisonous agent; and they are not infrequently the consequence of the inflammation of veins, or of the presence of morbid secretions or purulent matter absorbed into the circulation, (§§ 25—28.), or of the transfer of irritation from a distant part. But from whatever cause they may proceed,—and they may, and occasionally do, proceed from either of those sources,—deficient constitutional energy, and vital resistance to the influence of the exciting cause, with a marked disposition of the structures to be invaded by it, and to participate in the morbid action it excites, are their constant concomitants; requiring the energetic use of those means which are the best calculated to rouse the powers of the frame, to restore the deficient tone of the capillary vessels, and to thus enable them to form coagulable lymph, by which the spread of the local mischief may be limited. Instead, therefore, of having recourse to antiphlogistic remedies, the state of local action, and of constitutional power, requires a tonic, stimulating, and restorative treatment; conjoined with the means best calculated to promote the functions of all the abdominal viscera, so that morbid matters may be eliminated from the circulating current, and healthy nutritious elements conveyed into it; and with a pure air to perfect the changes which it undergoes during respiration, and which are requisite to the continuance of the functions of life. The treatment necessary in such cases is fully detailed in the articles on INFLAMMATION of VEINS, on SPREADING INFLAMMATION of the CELLULAR TISSUE, and on the treatment of ANIMAL POISONS.

63. 2d. *Of opening abscesses.* — When we fail in procuring the absorption of the puriform matter, its artificial discharge will, sooner or later, be required, when this can be accomplished. Certain abscesses require a more immediate performance of this operation than others, and more particularly the following: — 1st, Abscesses proceeding from the escape, into the substance of any organ or part, of irritating secretions or excrementorial matters, as the urine, or fæcal substances. 2d, Abscesses preceded by very acute inflammatory action, and occurring in cellular or adipose structures, as the margin of the anus, the sides of the neck, or the groins. 3d, Purulent collections deeply seated, or confined under fasciæ or aponeuroses. 4th, Abscesses formed in the parietes of the splanchnic cavities, in order to prevent the chance of their breaking internally. 5th, Abscesses formed in parts through which large nerves and blood vessels pass, and on which the purulent matter occasions a painful and injurious pressure; as abscesses in the neck, and underneath the sterno-mastoid muscle, at the top and inside of the thighs and arms, &c. 6th, Abscesses which embarrass the respiratory organs, and which press upon the larynx, pharynx, or trachea, or which endanger the integrity of those parts.

64. In all these the strict antiphlogistic treatment will be requisite, unless they are of the diffusive or consecutive kinds, with emollient applications, in order to limit the extent of the inflamed parts, to diminish their size, and to hasten their maturation; and in many cases this mode of treatment must be continued for a considerable time after the discharge of the matter, in order to limit or prevent its re-accumulation, and to promote the collapse and diminution of the parietes of the abscess. The cases where it will be frequently necessary to retard the period of discharging the purulent collection, are chiefly those in which it is formed in the internal viscera, as the liver, spleen, kidneys, lungs, &c.; respecting which I have treated fully under their appropriate heads.

65. Chronic abscesses should be opened as soon as it is shown that their absorption cannot be accomplished; or when they augment in bulk under the discutient and derivative treatment. Symptomatic abscesses also require to be opened, when we find that the means which we have directed to the original seat of disease fail of limiting their extension, or lessening their bulk. Consecutive abscesses require to have their contents immediately discharged, when their situation admits of this being done; for the morbid state of the matter they sometimes contain, and the weak vital resistance opposed by the surrounding parts, and by the constitution, favours the contamination of the adjoining structures, and, indeed, of the whole frame. But this intention can seldom be fulfilled, owing to the seat of the purulent collection; and, when it is put in practice, it should be followed by as complete an exclusion of the atmospheric air as possible.

66. It does not come within the scope of this work to notice, at this place, the different modes of opening abscesses, and the treatment with which the operation should be accompanied and

followed. This necessarily differs in every case; but that part of it which belongs to my province is stated at the place where abscesses in the different viscera are discussed, and the means which may be employed to procure the obliteration of their cavities, the *second* intention of cure, are noticed, with reference to abscess of each of the important viscera and structures in which it is liable to form.

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ABSORPTION. SYN. *Absorptio*, Lat. *Absorption*, Fr. *Die Einsaugung*, Ger. *Assorbimento*, Ital.

CLASSIF. GENERAL PATHOLOGY and THERAPEUTICS.

This is one of the most important functions in the system, and one of the most frequent channels through which disease is caused, perpetuated, or removed. As to each of these relations it requires a brief notice.

1. OF ABSORPTION IN RELATION TO THE CAUSATION, PERPETUATION, AND THE REMOVAL OF DISEASE. — The importance of entertaining accurate ideas as to the channels through which noxious agents affect the system, must be manifest. Without them, many of our pathological doctrines must be erroneous, and the therapeutical indications founded on them worse than useless: on the other hand, just views as to the nature and extent of the causes which operate through this medium, give rise to the most important inductions, — the chain of morbid causation is traced without interruption, the nature of pathological conditions is more accurately observed, and ultimate effects are recognised in due connection with remote causes. The practical advantages which accrue are great: prophylactic measures are based on sound principles; remedial agents are directed with precision; and the physician prescribes in a spirit of rational induction, instead of blind empiricism.

2. The agents which affect the system injuriously through the medium of absorption consist, *first*, of those which are external and foreign to the body, and act upon it only occasionally, or under certain circumstances; and, *secondly*, of those which are generated in the body itself, and, when carried by means of absorption into the current of circulation, produce very important effects. The *former* rank among the primary causes of disease; the *latter* are themselves the result of disease, but become important *secondary* causes, perpetuating and generally increasing its severity. The *first* class invade the system on the mucous and cutaneous surfaces, — the skin, the lungs, the alimentary canal, &c.: the *second* class form in the parenchyma or texture of organs and parts, or are generated on secreting surfaces, whence they are absorbed into the circulation. On each of these I shall offer a few remarks.

3. 1st. *Of absorption on the skin in relation to the production and removal of disease.* — *a.* That disease frequently proceeds in this way is evinced by certain contagious and chronic affections of the skin itself: that it is possible to produce various derangements, by applying to it several active agents, which affect this surface no further than in being absorbed from it, may be proved by direct experiment. But it is chiefly when the skin is deprived of a portion of its cuticle, however minute, that we perceive affections produced through the medium of cutaneous absorption. Several eruptive and contagious diseases are familiar examples of this; and the majority of deleterious agents produce a most decided effect when applied to the skin thus exposed.

4. *b.* The same channels through which disease invades the system, are often the most suitable through which to counteract or remove it. This is shown by the treatment of syphilis; by the use of baths, lotions, fumigations, and inunctions in cutaneous and visceral affections; and by the employment of various remedies to the skin, which are partially absorbed from it into the system. When the skin is deprived of a portion of its cuticle, it absorbs rapidly many of the most active agents employed in medicine; and it is thus rendered one of the most eligible situations to which we can direct our plan of cure. Thus, when the stomach will not retain the sulphate of quinine, it may be efficaciously administered to the denuded cuticle; or when we wish to produce an anodyne effect upon the system, or to assuage violent pain, the preparations of morphine, as the acetate, may be applied in this way. And in various diseases, when the function of deglutition is lost, or the mouth cannot be opened, certain active remedies may be thus administered; more especially those which operate their effects after having been absorbed into the circulation. Even purgatives, as the croton oil, and elaterium, some preparations of iodine, strichnine, prussic acid, tartar emetic, &c., if judiciously employed in this way, will be often productive of advantage, and are not infrequently required to be thus prescribed.

5. 2d. *Of absorption from the lungs in relation to the causation and removal of disease.* — *a.* There are very few, if indeed any, of the numerous maladies which are usually denominated infectious, that are not caused through the medium of the lungs. And, though the greater proportion of them are most probably induced from the morbid impression which their exciting causes make upon the nerves supplying this organ, yet several of them are also, more or less, occasioned by the absorption of the cause itself into the circulation, and by its influence upon the blood, and the nervous and vascular systems. Probably, also, certain other causes of disease, of no mean importance, particularly marsh miasmata, and noxious animal exhalations, act directly upon the organic nerves of the lungs, and on the blood itself, through the medium of absorption. We

have reason, moreover, not only to infer that the more material causes of disease are absorbed from the surface of the lungs, when inhaled into them with the atmosphere, in the moisture of which they are dissolved, or otherwise combined; but also that the foreign gases, which sometimes mix with the air, act in some measure through the same channel.

6. The organisation of the respiratory surfaces, the nature of the circulating functions on these surfaces, and the more immediate relation subsisting between the air in contact with, and the blood circulating in, them, will readily explain the rapidity with which foreign matters floating in the atmosphere are frequently conveyed into the circulation. Besides, we have strong reasons to infer that several of the gases, and of the soluble substances which float in the air, are carried directly into the blood from the surface of the lungs, without passing along absorbent vessels. The experiments of Professor Mayer, and of Drs. Lawrence and Coates, as well as those of MM. Segalas, Fodera, &c., fully confirm this inference; whilst those performed by MM. Magendie, Seiler, Ficinus, Tiedemann, Gmelin, and several others, show, that even in the alimentary canal, and especially when capillary vessels are divided in any of our tissues, the function of absorption is not confined to lacteal or lymphatic vessels, but is frequently extended to the venous capillaries, which, in respect of certain substances particularly, chiefly perform this function. Hence I may conclude that foreign substances dissolved in, or combined with, the moisture of the air, or mixed with this fluid, may, when inspired, be carried from the surface of the lungs into the blood, independently of the absorbent vessels; although, doubtless, these vessels perform their appropriate functions in this as in other parts of the body.

7. *b.* The rapidity of absorption in the lungs, and the ready access to the blood which foreign matters find through them, are sufficient to vindicate their importance as channels through which to convey our means of cure, not only in those maladies to which they are liable, but also in a number of diseases affecting the whole frame, or particular parts of it. General suggestions on this subject are all that can be advanced in this place: the particular recommendations for its use are given in their appropriate places. Those gaseous bodies which possess active medicinal powers; all those remedies which are more or less volatile, or are soluble in aqueous vapour; and many medical substances which may be rendered volatile or soluble in water, when combined with other bodies that do not destroy altogether their remedial powers, may be prescribed advantageously through the medium of the lungs. Chlorine, the nitrous oxide, dilute oxygen gas; the vapour of iodine, or the sulphuret of iodine; the vapour of turpentine, camphor, of the common, the aromatic, or the pyroligneous vinegars; tar vapour; the chlorides or chlorurets of lime or of soda; aqueous vapour holding the active principles of opium, henbane, hemlock, belladonna, digitalis, colchicum, &c. in solution; the volatile principles of various salts, the aroma of a number of vegetable bodies, — all exert powerful effects upon the system when administered in this way.

8. *c.* Through this channel a number of fevers, especially those which are characterised by great depression of the powers of life, or which rapidly pass into this state; various chronic affections of the lungs themselves, which are unattended by acute inflammation, but consist chiefly of a morbid state of the respiratory nerves, and are accompanied with spasm, and a morbidly increased secretion; the different kinds and forms of asphyxy; the diseases which threaten life by interrupting the respiratory functions; and various maladies in which the blood is vitiated, and where it becomes important to act in a direct and decided manner on this fluid, and on the circulating organs generally, may be successfully combated.

9. *d.* The knowledge that we thus acquire respecting the channels, through which the causes of many diseases invade the system, and the remedies for removing them may be efficaciously administered, furnishes us with important indications as to the employment of *prophylactic measures,* and rational plans of regimen and hygiene. Miasmal or contagious fevers furnish us with numerous opportunities of proving the justness of these views. Observation shows us that the causes of this class of disease act upon the system chiefly from their presence in the air we breathe: it further enables us to decide that these causes invade the system chiefly through one of two, or perhaps by both, routes; viz. by the nerves supplying the respiratory organs, or by the partial absorption of the causes themselves, from the pulmonary mucous surface, into the circulation. From the same source, or from the collateral evidence of experiment, we know that foreign substances do not so readily enter the circulation, when its functions proceed with energy, and the vital resistance is perfect, as when they act feebly and imperfectly; and that the depressing causes of disease have less power over the nervous influence of the respiratory organs, and of the system in general, when the vital actions which take place in the lungs are performed with due activity. The same sources of observation make us acquainted with the important facts, that the dilution of the atmosphere, which contains the causes of febrile diseases floating in it, by free ventilation; that the destruction, or neutralisation, or counteraction, of these causes, by the evaporation of certain disinfectant and stimulating agents; and that a due energy of all the vital and secreting functions, with an equable state of the mental powers and manifestations, and with a steady confidence; are the most successful means of preventing the attack and diffusion of those maladies.

10. By combining these facts as to the source, mode of operation, and methods of counteraction, of the chief causes of a most important class of maladies, and by directing the measures they suggest as far as may be according to the peculiarities of individual cases and diseases, we are thereby enabled to furnish persons, and even whole communities, with instructions and means calculated either to counteract or to lessen the dangers to which they are exposed.

11. 3d. *Of absorption from the alimentary canal, in connection with the causation of disease.*—*a.* It may be received as a pathological axiom, that the rapidity and extent with which deleterious matters are absorbed from the digestive mucous surface, as well, indeed, as from the respiratory, and other organs of the body, are nearly in pro-

portion to the depression of the nervous energies and vital resistance of the system. The truth of this is evinced in respect not only of the actions proceeding on the mucous surfaces, but also of those taking place in the different organs and structures. It is necessary to allude here to the numerous agents which cause, counteract, or remove disease, by their being absorbed from the alimentary canal. Whilst many agents produce their effects chiefly by modifying the states of the nerves and mucous tissue of this canal, others act principally from being absorbed, either by the lacteals, or by the venous radicles, and carried into the circulation; and a still more numerous class seem to operate through both channels, impressing immediately the nerves and tissues to which they are applied, and subsequently being absorbed into the blood, where they produce important effects not only upon this fluid, and on the vascular system, but also upon the functions of various secreting organs, especially those by which they are eliminated from the body.

12. A very large proportion, therefore, of the ingesta, whethether alimentary, medicinal, or poisonous, thus acting upon the system chiefly through the medium of absorption, the importance of directing a considerable portion of attention to this function in our pathological investigations, as well as in the appropriation of medicinal means, must be apparent. Besides these more obvious relations of the subject, there are others which have been either imperfectly investigated or entirely overlooked. To these I can merely allude: but amongst the most interesting are the absorption of unwholesome and imperfectly digested chyle from the intestinal surface; the absorption of a portion of the vitiated secretions which occasionally accumulate in the alimentary tube, particularly in the cœcum and cells of the colon; the absorption of some part of the fæcal matters, when they are long retained in the above situation, as evinced by the sensible qualities of the perspiration, foul state of the skin, &c., or of the obstructed and accumulated urinary secretion, as proved by similar phenomena; the passage of bile into the circulation, when it has been retained in the liver, the biliary ducts, or gall-bladder, from torpor or obstruction of these parts, or when it is secreted in large quantity, and does not readily pass off with the egesta. All these are very fruitful sources of disease; and, although generally connected with some degree of pre-existing disorder, or of torpid function, they are often the chief aggravating causes of many of the maladies we are called upon to treat, from the constitutional and visceral disturbance they occasion and perpetuate.

13. There are few disorders which implicate the digestive and chylopoietic organs, and very few febrile diseases, which do not, at some period of their course, evince signs of the absorption into the circulation of a portion of the morbid secretions or fæcal fluids retained in the alimentary canal, when due evacuations are not practised. Therefore, besides the other effects produced by medicines of this class, the due evacuation of these secretions and fæcal matters from the prima via is one of the best offices they perform.

14. *b.* It is unnecessary to do more than to allude to the advantages that accrue to the scientific practitioner from some knowledge, — although, in the present state of medicine, necessarily imperfect, — of the remedies which act by being absorbed, either altogether or in part, from the alimentary canal. Most of those substances which are found by experience the most efficacious in promoting the actions of the different secreting viscera, and in producing a marked and permanent change of the general state and functions of the economy, operate after having been absorbed into the circulating current, and conveyed through this channel to vital and secreting organs; and, although, during the healthy performance of the secreting functions, or whilst the vital energies are not far reduced, these substances seldom accumulate in the blood so as to be detected in it by chemical analysis, owing to the balance which is preserved between the rapidity of absorption and the activity of elimination, yet their passage through it is proved by the fact, frequently observed in regard of all of them, of their being found in the secretions of the eliminating or depuratory organs. This fact was established by experiments performed by myself, — some of them as far back as 1819, — and published in several periodicals in 1821 and 1822.

15. 4th. *Of absorption from diseased organs and structures.* — *a.* When morbid secretions are generated, or accumulated in any organ or texture, or when any part is changed in such a manner as to secrete a matter different from the healthy constituents and fluids of the body, the matter formed is generally, after a while, absorbed into the circulation, and contaminates, in a more or less marked manner, according to its nature, the other fluids, and the soft solids, and thereby at last destroys life. Illustrations of this procedure are furnished us in the pathological history of internal and deep-seated abscesses; in some morbid states of the uterus; in scirrho-cancer, fungous hæmatodes, and other malignant diseases. The celerity with which the absorption of the morbid matter and the contamination of the frame proceed, is generally according to the principle already recognised (§ 9.), — in proportion to the diminution of the vital energy and resistance of the constitutional powers.

16. *b.* The commencement of the contamination can scarcely be determined by an appreciation of symptoms: but the experienced observer will readily recognise, in the colour of the surface of the body; in the state of the heart's action, and of all the circulating functions, as well as in the blood itself; in the failure of the energies of life; in the morbid condition of the nervous functions and of the powers of the stomach, and indeed of the whole digestive canal, sufficient proofs of the early, as well as of the advanced progress of disease, arising from the absorption of morbid matters from the primary seat of morbid action, and the consequent vitiation of the circulating fluids, of the soft solids, and of the secretions and excretions of the body. (See *Art.* Blood.)

17. In many of the more chronic diseases which either commence with or terminate in the malignant state, this contamination is frequently first evinced by the tumefaction and pain of adjoining lymphatic glands, owing to the irritation produced by the morbid fluid conveyed into them: the inflammation or obstruction thus produced in them becoming an obstacle to the rapid transit of the morbid matters from the original seat of disease into the circulation. But in many cases this is an

insufficient barrier; and in others, these matters seem to pass onwards, either without circulating through lymphatic glands, or without occasioning irritation, obstruction, or inflammation in them; or are almost directly conveyed into the venous circulation. Whatever may be the channel of conveyance, there can be no doubt of the fact — the practical importance of which is very great — that the rapidity of the absorption of morbid matters, and extent of their hurtful effects on the constitution, are in proportion to the depression of the vital energies of the frame, — this depression being frequently the cause of their absorption, particularly in respect of puriform fluids; or at least the circumstance which more especially favours its occurrence, and the rapidity of its progress.

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ABSTINENCE. *Its Morbid Effects.* Syn. *Abstinentia*, Lat. *Astinenza*, Ital. *Die Enthaltung*, Ger. *Abstinence*, Fr. *Starvation from Hunger*.

Classif. I. Class, V. Order (*Author*, see *Classification in the Preface*).

1. It does not come within the scope of this work to enter upon the consideration of the therapeutical relations of abstinence; but that the practitioner should be acquainted with the states of disease which it occasions, and with the best means of treating it, is extremely important; more especially as, when it is too rigidly enforced during the treatment of several diseases, it not unfrequently gives rise to effects of a serious nature, which not infrequently have been mistaken for the spontaneous course of the malady.

2. Of the Morbid Effects of Abstinence. — Abstinence has been long employed as a means of cure, and generally as a part of the antiphlogistic regimen, in a very great number of diseases, particularly in fevers and inflammatory affections. Very great difference, however, exists both among writers and practitioners as to the extent to which it should be carried, and the maladies in which it ought to be prescribed. As to its applicability to the class of diseases now noticed, there is no doubt: but in disorders of debility, or of irritation merely, particularly those which occasionally simulate chronic inflammation, and in various nervous affections, it is extremely injurious; and I believe that it has been carried to a hurtful extent in many of these affections, particularly by Broussais and his followers, as indeed has been recently well shown by MM. Piorry and Barras. A case of this description, which had been long under the care of M. Broussais, very lately came before me, with many of the morbid effects of this practice, which had been carried to a hurtful extent. There can be no doubt, however, that it is extremely beneficial, when carefully watched and regulated, in many of the diseases of the stomach and its associated viscera; but the fact is equally incontrovertible, that it will often produce effects very nearly resembling those for which it has been prescribed. The importance, therefore, of keeping these effects in recollection, when treating several diseases, particularly those of irritation and debility, must be apparent.

3. In appreciating the usual effects of abstinence it is extremely requisite to be aware of two things: 1st, That the effects vary with the state of the patient at the time that abstinence is endured; 2d, that they differ materially according to the suddenness with which it is entered upon, the extent to which it is carried, and the circumstances with which it is associated. By very corpulent and plethoric persons, abstinence is generally borne well for a long period, and by those labouring under febrile or inflammatory excitement; and it is, in them, one of the most necessary means to diminish the one and lower the other. In these, particularly the latter, total abstinence may be endured for many days; whilst, if carried to the same extent in healthy persons, its effects would be fatal, or nearly so. Abstinence, also, is longer endured by persons of the middle or matured epochs of life, than by those of an early age.

4. That the absolute or sudden deprivation of food should be productive of more rapidly serious effects is very obvious; but it is not so well known that there are circumstances, which modify the effects of the less absolute states of abstinence, and which, when thus combined, give rise to very important and dangerous diseases. In order to place the subject more clearly before the reader, I will *first* notice the effects of abstinence simply, and unassociated with other causes of disease; and *next*, the morbid conditions, which its association with certain influential agents usually occasion.

5. 1st. *The morbid effects of simple abstinence.* — Keeping in recollection the modifications depending upon the extent to which deprivation of nourishment is carried, and the age and state of the person at the time of its adoption, I may briefly describe the morbid effects of abstinence as follow: — Paleness and languor of the countenance; muscular debility and emaciation; a weak and small pulse; thirst; at first quickness of intellects, constipation, and flaccidity of the muscles. To these succeed increased frequency of pulse, palpitations, alternating with leipothymia, or even full syncope; headach or delirium; flashes of light before the eyes; tinnitus aurium; slight amaurosis; parched state of the throat, and thirst; pains in the stomach; great wakefulness, followed by delirium, sometimes mild, but in other cases furious, or at first mild or muttering, and afterwards strong or furious; sinking of the animal heat, or alternate coldness and burning in parts of the body; and lastly, morbid sensibility of the organs of sense and surface of the body, and greatly depressed temperature, followed by insensibility, stupor, or coma, terminating in death.

6. It is obvious that the severity and duration of these symptoms will vary in different cases, according to circumstances peculiar to each. But it is not so well known that they will be actually produced by pursuing a too rigid abstinence in the treatment of various diseases, and particularly when the nature of the disease is mistaken: as when the irritative symptoms frequently attendant upon diseases of debility, or on nervous affections, are viewed as resulting from inflammation. Many cases have occurred to me in the course of practice, where the antiphlogistic regimen, which had been too rigidly pursued, was itself the cause of the very symptoms which it was employed to remove. Of these symptoms, the affection of the head and delirium are the most

remarkable, and the most readily mistaken for an actual disease requiring abstinence for its removal. A case of this description lately occurred to me. A professional man was seized with fever, for which a too rigid abstinence was enforced, not only during its continuance, but also during convalescence. Delirium had been present at the height of the fever, and recurred when convalescent. A physician of eminence in maniacal cases was called to him, and recommended him to be removed to a private asylum. Before this was carried into effect, I was requested to see him. A different treatment and regimen, with a gradual increase of nourishment, were adopted, and he was well in a few days, and within a fortnight returned to his professional avocations.

7. *The morbid appearances* observed after fatal cases of deprivation of food possess some interest. The most remarkable are the emaciation and absorption of every particle of fatty matter: the paleness, flabbiness, softening, and emaciation of the voluntary muscles, and of the substance of the heart; an exsanguined and pale state of the viscera; slight atrophy of the liver and spleen; diminished size of the stomach and colon; and particularly the increased vascularity of the brain, and sometimes of the membranes also, compared with the other viscera. It would seem that a very large proportion of the blood continues, as in many cases of great vascular depletion, to be sent to the brain to the very last. This is obviously owing to the pressure of the air on all parts of the body, from which the encephalon is guarded by its unyielding case. In addition, also, to the vascularity of this part, a limpid serous effusion between the membranes, or in the ventricles, is sometimes met with.

8. 2d. *Of the morbid effects of abstinence when it is associated with other hurtful agents.* — These effects are occasionally presented to medical men under a variety of circumstances, and from a varied combination of causes; but in the great majority of instances they result from deficiency of food merely, rather than from a rigid abstinence, conjoined with the depressing influence of cold or insufficient clothing, great or continued exertion, or with a moist and unwholesome atmosphere. Thus we find the association of these causes, particularly insufficient or unwholesome food, laborious exertion, mental depression, a moist, cold, or unwholesome atmosphere or locality, not unfrequently give rise to purpura hæmorrhagica, scurvy, scorbutic dysentery or diarrhœa, low or typhoid fevers, affections of the brain and nervous system, emaciation, with chronic ulcerations, &c. —effects which have received a particular notice in their respective articles.

9. The best illustration of the effects of this association of other agents with a continued deficiency of food is furnished by the diseases which appeared a few years ago in the Milbank Penitentiary. The prisoners confined in this prison were suddenly put upon a diet from which animal food was nearly altogether excluded, excepting in as far as it entered into the composition of a weak soup. They were at the same time subjected to a low grade of temperature, to considerable exertion, and confined within the walls of a prison situate in the midst of a marsh which is below the level of the adjoining river. The consequences were, first, loss of colour, of flesh and strength; subsequently, diarrhœa, dysentery, scorbutic dysentery, scurvy; and, lastly, low ataxic or adynamic fevers, or headach, vertigo, convulsions, delirium or mania, apoplexy, &c. The smallest loss of blood produced syncope or leipothymia, and fatal results. Yet, in the great majority of the fatal cases, independently of the lesions observed in the mucous surface of the digestive tube, or in other situations, increased vascularity of the brain and its meninges, frequently with effusion of fluid in the ventricles or between the membranes, was found upon examination after death.

10. The Treatment of the morbid effects of abstinence is very obvious, yet considerable care is necessary to its successful issue in very urgent cases. Nourishment should be administered cautiously, in a very small quantity at a time at first, but frequently. It ought to be bland and farinaceous: animal food may be entered upon subsequently, and the quantity gradually increased. The animal warmth should be promoted, at the same time, by the usual external means — by frictions and warm applications; and the bowels assisted by the occasional use of bland enemata. Soups may be allowed early in the treatment, but in a small quantity at a time. Milk is often prejudicial, unless diluted and made into gruel with some of the farinaceous articles of food. Internal stimulants are seldom required, unless when symptoms of cerebral or nervous irritation exist, when they may be given; particularly the preparations of ammonia, the æthers, camphor, vegetable bitters and tonics, at first in very moderate doses, in conjunction with small quantities of an anodyne, as the extract of hop, the extract of hyosciamus or of opium, the paregoric elixir; and by warmth, frictions, and stimulating applications to the cutaneous surface and lower extremities. These means will generally succeed in removing the effects of simple abstinence whilst they admit of removal. The treatment of the effects resulting from the conjunction of other causes with the one now discussed, is considered under their respective heads.

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ACNE. ’Ακνη. Derived, according to Cassius (*Nat. et Med. Quest.*, &c., Prob. 33.), from ’ακμη. Syn. ῞Ιονθος, Gr. *Varus*, Lat. *Psydracia Acne*, Sauv. *Gutta Rosea*, Darwin. *Ionthus*, Good. *Bouton*, *Couperose*, Fr. *Die Finnen*, Ger. *Carbuncle*, *Stone-pock*, *Whelk*.

Classif. 3. *Class*, Diseases of the Sanguineous Function; 2. *Order*, Inflammation (*Good*); 7. *Order*, Tubercles (*Willan* and *Bateman*). IV. Class, IV. Order (*Author*, see *the Classification*).

1. Defin. *Hard, inflamed, tubercular tumours, suppurating very slowly; occurring chiefly in the face; sometimes, also, on the neck and shoulders.*

2. One or more, sometimes a number, of these tubercles appear, generally in succession, in the face, and sometimes on the neck, shoulders, and

breast, but never lower; remain permanent for a considerable time; and suppurate slowly and imperfectly, leaving a dark or livid mark, which gradually disappears. They occur chiefly in persons of the sanguine temperament; commencing at the period of puberty, and generally disappearing after thirty or thirty-five. They are common to both sexes, but are most frequent and numerous in the male sex.

3. This is one of the most constant and unvarying in its characters of any of the affections of the skin; but writers upon this class of diseases differ widely in respect both of its particular character and seat. Willan, Plenck, Bateman, and Thomson consider it a tubercular affection; whilst Alibert, Biett, and Rayer view it as pustular. I believe, however, that both opinions are in some respects correct; and that in certain forms or states of acne the tubercular change is predominant, little or no suppuration taking place, but a state of slow inflammation giving rise to a continued exfoliation of the cuticle, or formation of thin scabs on their apices; and thus they slowly disappear; whilst in others the pustular character is very distinct, but always preceded by the characteristic tubercular hardness. This affection may be viewed, therefore, as forming an intermediate link between the tubercular and pustular eruptions.

4. In respect of the particular tissue in which this disease is seated, some difference of opinion also exists. The greater number of writers on the pathology have considered this disease to be seated in the proper structure of the cutis vera; many of them admitting, at the same time, an affection of the sebaceous follicles very nearly resembling it. Mr. Plumbe, however, attributes it entirely to obstruction and chronic inflammation of these follicles. I believe that this opinion is too restricted; and that, whilst one form of acne evidently depends upon this cause, others are essentially disease of the cutis vera.

5. Spec. I. Acne Simplex, *Simple Acne*. Syn. *Gutta Rosea Hereditaria*, Darwin. *Dartre Pustuleuse Miliure*, Alibert. *Ionthus varus simplex*, Good.

Simple acne affects most frequently young subjects, at the period of puberty, and particularly females. They generally appear on the forehead, shoulders, and upper part of the thorax, and are liable to recur at the menstrual periods, especially in cases of dysmenorrhœa. Many of these vari do not proceed to suppuration, but slowly subside. They are very commonly developed in succession; commencing with small, hard, and inflamed tubercles, of the size of a pin's head. These continue to enlarge for three or four days, and the inflammation becomes more apparent. In seven or eight days they have reached their greatest size. They are then dark red, smooth, prominent, shining, hard, and slightly painful to the touch. After two or three days a small speck of matter appears on the apices of some of them; and when these break, a thin humour exudes from the tubercular induration, and dries on its surface, forming a thin scab, which adheres firmly; but, after a few days, is loosened at the edges, and falls off; the tubercular hardness and livid redness gradually subsiding, and disappearing after three or four weeks.

6. In some persons this eruption recurs frequently at short intervals, the vari being more or less numerous; in others it is more extensive, and never altogether disappears, although it is more troublesome at one time than another. When the vari are numerous, many of them undergo no suppuration; but the sebaceous glands are often excited, giving the skin a greasy appearance. In many of these cases, several of the vari assume the characters of the next species.

7. Spec. II. Acne Indurata, *Stone-pock.*

The tubercles are larger, more indurated and permanent than the foregoing; and are apparently the consequence of a slower and more deep-seated inflammation. They often appear in considerable number, of a conical or oblong-conoidal form; some of them assuming a roseate hue, and tending to suppuration at their apices; others remaining in a hard, elevated state for a very long time, without any appearance of the suppurative process, or disposition towards it. In some cases, two or even more of them coalesce, and occasionally suppurate at their respective apices; but one only may undergo this change. As they continue they become more purple or livid, particularly when they have no tendency to suppurate. When they experience this process, the same process of scabbing and exfoliation, already described (§ 5.), is gone through; but it sometimes happens that when they experience any irritation they may suppurate a second time. As they very slowly subside, they leave a purple or livid discoloration, and, occasionally, a slight depression, which is long in wearing off, and which sometimes never altogether disappears.

8. This species of acne generally is most frequent and numerous along the rami of the lower jaw, on the temples, the nose, and cheeks; also on the back and neck. They are frequently accompanied by a greasy state of the skin, from an excited state of the cutaneous follicles; are commonly sore and tender to the touch; and, when numerous, are in every stage of progress, giving the surface a spotted and variegated appearance,— owing to the prominence and redness of some at their commencement, to the yellow points in those that are suppurating, to the scaly crusts covering those which have undergone this process, to the lividity of those that have exfoliated or are subsiding, and to the discoloured depressions which others have left after them.

9. The general health seldom suffers materially from either the simple or the indurated acne, excepting as far as regards some pre-existing and concomitant disorder of the digestive functions. If fever, or acute disease, attack persons affected with these eruptions, the vari generally disappear; but they frequently also re-appear upon its subsidence, becoming in some respects a critical eruption.

10. Spec. III. Acne Rosacea, *Rosy-drop.* Syn. *Gutta Rosea*, Auct. var. *Gutta Rosea Hepatica*, Darwin. *Ionthus Corymbifer*, Good. *Dartre Pustuleuse Couperose*, Alibert. *Goutte Rose, Couperose Rougeurs*, Fr. *Kupferbandel, Roth-nase*, Ger. *Carbuncled Face*, Eng.

The *first* and *second* species, described above, might have been, with propriety, viewed as varieties of the same species; but this is a very distinct species from the preceding. It consists of small, slowly suppurating tubercles, accompanied

with a shining redness, and an irregular granulated appearance of the skin of the part affected. This species commonly appears first at the end of the nose, and afterwards spreads from both its sides to the cheeks, which it never altogether covers. At first it is not uniformly red; but is pale in the morning, and intensely red whenever the patient is excited or heated, and particularly after dinner, or drinking wine or spirits. After some time the texture of the cuticle is gradually thickened, and its surface granulated and variegated by the ramifications of cutaneous veins, and the suppuration of small, prominent vari, which successively arise in different parts of the nose and face.

11. This species of acne seldom appears before the age of forty, excepting in those addicted to the immoderate use of vinous or spirituous liquors, or who possess great hereditary predisposition to it. In advanced life, or in the worst of these cases, it sometimes spreads to the greater part of the face, even to the forehead and chin. The nose usually becomes very tumid, and of a fiery red colour, and sometimes is enlarged to an enormous size. The nostrils, in these cases, are generally distended, and their alæ often fissured and divided into lobes. In advanced age, this species of acne becomes more livid; and if any of the tubercles suppurate, they often ulcerate, and are indisposed to heal. In younger persons, who are attacked chiefly from hereditary disposition, it is often accompanied with irregular red patches on the face, which are often smooth, devoid of tubercles, and accompanied with occasional slight exfoliations of the cuticle. These patches are extended, or aggravated, by intemperance in food or drink.

12. Spec. IV. ACNE PUNCTATA, *Maggot Pimple.* Syn. *Crimones,* Auct. var. *Punctæ Mucosæ,* Darwin. *Ionthus Varus punctatus,* Good. *Der Gries,* Ger. *Tannes,* Fr. *Grubs,* Eng.

This is, in my opinion, the only species of acne which is seated in the follicular glands; and, although often observed as the only form of eruption, it also is frequently found intermingled with the species already described, particularly the first and second. It consists of a number of black points, surrounded by a very slightly elevated border of cuticle, proceeding from concreted sebaceous matter accumulated in the glands and their ducts, whence it may be squeezed out in a vermicular form, the external extremity being dark from its exposure. In consequence of the accumulation and distension, these glands sometimes become inflamed, and give rise to small tubercles, with minute black points in the centre of their external surface. These tubercles suppurate partially, as the preceding, whilst others remain stationary for a considerable time, and several are distended without even being inflamed. They are not infrequently mixed with tubercles without the black punctæ, which are evidently owing to a similar obstruction, and to a more complete closure of the outlet of the ducts. In this species of acne the accumulated secretion may be squeezed out.

13. Spec. V. ACNE SYPHILITICA, *Venereal Acne.* Syn. *Gutta Rosea Syphilitica,* Plenck. *Syphilide Pustuleuse Miliaire,* Alibert.

Amongst the very numerous forms of cutaneous affection in which secondary syphilis may manifest itself, this may be enumerated as one, although not a common one. PLENCK has given a very correct description of it. This species nearly resembles, in the size and form of the pustules, the acne rosea. It chiefly affects the forehead, face, neck, and upper part of the trunk. The vari are round and conical, with an inflamed, copper-coloured, tubercular base and areola. They suppurate slowly at their apices, where a yellowish brown scab is formed; and leave a dirty, dark, and slightly depressed mark. They present a darker colour, and more permanent tubercles, on the nose, the adjoining parts of the cheeks, and forehead, than elsewhere; and are there observed in discoloured patches, in every stage of their growth. They are frequently found complicated with other eruptions, chiefly of a scaly character, on different parts of the body; are always a secondary venereal affection; and, although sometimes unaccompanied with other syphilitic symptoms, are most commonly attended with ulcerations in the throat, with nodes, inflammation of the periosteum, and nocturnal pains.

14. DIAGNOSIS. — *Acne* can be confounded only with *ecthyma.* The tubercular pustules of the former, however, are small, slowly developed, with an indolent and hardened base; whilst the pustules of *ecthyma* are large, superficial, unaccompanied with chronic induration, and forming thick scabs, more or less prominent, much less adherent, and such as never are formed in acne. The characters of *syphilitic acne,* the antecedent and accompanying symptoms (§ 13.), the colour and predominance of the eruption about the nose and commissures of the lips, the tendency of the vari to ulcerate, and the associated affection of the throat, and sometimes of the periosteum, sufficiently mark the nature of this species of the disease.

15. The PROGNOSIS of acne regards merely the persistence of the eruption, and the inconvenience attendant on it. Acne *simplex* and *punctata* are often of comparatively short duration. The acne *indurata* is much more tedious; and in some constitutions will resist, even for many years, every mode of treatment, particularly if the causes in which it not infrequently originates be overlooked. *Acne rosacea* is seldom or ever cured, excepting by a strict attention to regimen.

16. The CAUSES of acne are extremely various. The species *simplex, indurata,* and *punctata* usually occur during youth, in the sanguine and bilious temperaments, and disappear about middle age. They are very generally connected with chronic affections of the stomach, bowels, and liver; with hæmorrhoids; in some, with a tendency to phthisis; and in females, with painful and scanty menstruation. These species, as well as the acne *rosacea,* evidently arise, in many cases, from hereditary predisposition; and are most common in cold and moist climates, — probably owing to the use of ardent spirits. Excesses at table, cold indigestible articles of food, sedentary habits, fits of passion, anxieties of mind, and the depressing passions, cold drinks — particularly if taken when the body is overheated — the use of irritating cosmetics, and disorder of the digestive functions, are very common causes of these eruptions. I believe, however, that the simple, indurated, and punctated species of acne are most frequently occasioned by uterine irritation,

and excitement, or an imperfect performance of the uterine functions; by constipation; by torpid conditions of the liver; and by the injurious addiction to onanism.

17. Treatment. — In the treatment of these affections, our chief attention ought to be directed to their pathological relations and causes. These latter must be removed as far as may be done; and the former should both guide our indications, and direct our means of cure. The apprehensions entertained by the older writers, of producing internal disease by the sudden repulsion of the eruption, were founded on the results of observation, although explained by partially inaccurate or unsound pathological views. Affections of the stomach, bowels, chest, and head, have been thus induced, and been relieved upon a re-appearance of the eruption: but such consecutive diseases are more common after the repulsion of other eruptions. We should, however, as being both the safest and the most permanent method of cure, direct our remedies to the constitutional or internal relations, as well as to the external manifestations of disorder.

In the treatment of this, as well as many other diseases, the causes, the state of the habit and constitution of the patient, its morbid relations, and its duration, are severally to be kept in recollection.

18. 1st. *Treatment of acne simplex.* — In delicate constitutions, the chief attention should be directed to the state of the digestive functions. These should be promoted by gentle *aperients*, combined with *tonics*, and the functions of the skin promoted, by preserving a free transpiration on its surface. With this view, *sulphur* may be combined with magnesia, or with cream of tartar, and confection of senna, and taken in a sufficient dose, at bedtime, to procure a full evacuation in the morning, or any one of the formulæ (Ap. Nos. 82. 89. 98.) may be had recourse to. These may be occasionally changed for a powder with rhubarb, sulphur, and magnesia, or for the extract or decoction of taraxacum, with subcarbonate of soda or sulphate of potash. If the functions of the liver are torpid, the following may be taken for a few nights: —

No. 6. ℞ Pilul. Hydrarg. Submur. Comp. ℈j.; Fellis Tauri Inspiss. gr. xv.; Saponis Castil. gr. x.; Extr. Taraxaci ʒj. M. Fiant Pilulæ xviii., quarum capiat binas vel tres horâ somni.

After the bowels have been evacuated, and the secretions brought to a healthier state, the dilute *mineral acids*, either alone or with *bitter infusions*, may be taken through the day.

19. When the eruption occurs in young plethoric persons, and when it is in females attended with scanty and difficult menstruation, small *blood-lettings* may be practised; in the latter, by the application of *leeches* to the superior and internal parts of the thighs. In more delicate females the functions of the lower bowels are to be promoted by the pilula aloës cum myrrha, combined either with pilula ferri composita, or with the extractum gentianæ. When the eruption is obviously connected with imperfect and painful menstruation, the use of the warm salt water *hip-bath*, or of the hip vapour bath, or warm salt water *pediluvia*, after the application of a few leeches to the insides of the thighs, will be extremely serviceable. In such cases, the internal exhibition of the *sub-borate of soda*, either in the form of pill or draught, combined with camphor, the extractum taraxaci, or the extr. rutæ, or, as directed in Form. Nos. 93. 184. 209. 254. will be found of great advantage.

20. In addition to these internal remedies, which require to be varied according to different pathological relations of the eruption, external applications will be necessary; and when conjoined with the above treatment, or employed subsequently to it, no dread may be entertained of any injurious consequences from them. The ancients, particularly Celsus, Pliny, Aetius, Paulus, Actuarius, &c. recommended lotions and liniments with vinegar and honey; and these sometimes combined with turpentine, emulsion of bitter almonds, myrrh, alum, soap, Cimolian earth, the bruised roots of the lily, the cyclamen, narcissus, and the fruit of the wild vine; the most of them calculated to be advantageous in many states of the common forms of acne.

21. If the tubercles are much inflamed, and inclined to be pustular, mildly stimulating applications are most serviceable, as *dilute spirit*, or the *pyroligneous acetous acid*, or *liquor ammoniæ acetatis*, with rose or elder-flower water. In the more indolent cases, or when the skin can bear an augmented stimulus, Willan and Bateman recommend from half a grain to a grain, or more, of the *muriate of mercury*, in each ounce of the vehicle; or a drachm or more of the *liquor potassæ*, or of the *muriatic acid*, in six ounces: and Thomson advises that the emulsion of bitter almonds, containing ten minims of *hydrocyanic acid* to each fluid ounce of the emulsion, should be the vehicle adopted. The solution of the *sulphuret of potass*, in the proportion of a drachm to twelve or sixteen ounces of water, may also be employed; and, in the more obstinate cases, the *baths* directed in Form. No. 14—17. may be had recourse to. The solution of the *muriate of ammonia*, either alone or with the chloride of mercury, is often serviceable.

22. The lotion from which I have derived the greatest advantage in practice, and which I have found the most generally applicable, is a solution of the *sub-borate of soda* in rose or elder-flower water, or in water which had been poured in the boiling state over sulphur, and allowed to infuse for ten or twelve hours. The borax may also be dissolved in equal quantities of elder-flower water and honey, and used as a lotion in the more chronic cases.

23. 2d. *Treatment of acne indurata.* — In young and plethoric subjects, or in females, when the eruption is accompanied with a scanty and painful menstruation, the treatment already pointed out (§ 19.), should be put in practice. When we suspect that sexual irritation or masturbation is connected with the causation of the eruption, early rising, mental occupation, the use of gentle cooling aperients, of soda combined with small doses of camphor, soda water, sulphur with soda or antimony, are the most serviceable internal remedies. After these, the mineral acids, the sulphureous mineral waters, and gentle vegetable tonics, will be useful. Where the eruption is dependent upon torpid function of the stomach, or liver, or bowels, mild alteratives, exhibited at bedtime, as the pills already prescribed (§ 18.), and gentle tonics through the day, will be required. In a most obstinate case, which some time ago came before me in a lady, whom all the prac-

titioners who had acquired a reputation in the treatment of cutaneous affections had attended, strict attention to the state of the digestive and uterine functions removed the eruption. The following electuary has sometimes been used by me in this and other obstinate cases.

No. 7. ℞ Potassæ Supertart. in pulv. ʒ j.; Sub-boratis Sodæ ʒ ijss.; Sulphuris Præcip. ℥ss.; Confectionis Sennæ et Syrup. Zingiberis āā ℥ jss. M. Fiat Electuarium, cujus capiat Coch. unum minimum omni nocte.

At the same time a solution of two grains of the chloride of mercury in four ounces of the compound tincture of cinchona was prescribed, and a teaspoonful of it directed to be taken twice daily, in half a glass of infusion of camomile flowers. The lotion already recommended (§ 22.) was also employed. In cases similar to this, and, indeed, in all those accompanied with disorder of the digestive functions, cold or drastic purgatives ought to be avoided; and the bowels should be regulated with the pilula aloës cum myrrha, combined with a little blue pill, or with the pill prescribed above (§ 18.); or the ext. aloës purif. conjoined with the extr. gentianæ; or the electuary now directed. Advantage will also be obtained from a draught of infusion of cascarilla, or of calumba, with subcarbonate of soda or potass, or the liquor potassæ, taken twice a day.

24. As to *external applications* in this form of acne, little need be added to what has been already stated. The lotions with the chloride of mercury, or with the borax, are most to be depended upon, particularly when dissolved in an emulsion of bitter almonds, or in camphor mixture, with the addition about twelve minims of the hydrocyanic acid to each ounce of the vehicle. In cases where the tubercles have at all suppurated, it will be advisable to open them with the point of a lancet before the lotion is used.

25. At the commencement of the eruption, mild emollient poultices and fomentations are useful; and afterwards, particularly in the more obstinate cases, M. Biett, and after him MM. Cazenave and Schedel, recommend the following ointments to be used, in order to promote the resolution of the tubercles: —

No. 8. ℞ Protochlor. Hydrarg. et Ammoniæ* (Submur. Hydrarg. et Ammon.) ℈ j.—ʒ j.; Axungiæ ℥ j. Misce.

Of this ointment I have had no experience; but the following I have employed with advantage in several chronic eruptions, and in two cases of this species of acne: —

No. 9. ℞ Sulphureti Iodinæ gr. xii.—xxiv.; Axungiæ ℥ j. M.

Ambrose Paré and Darwin considered that blistering successively small portions of the face was the most successful means of ridding it altogether of this very obstinate eruption. This practice has been employed at the hospital St. Louis, by M. Biett, with great benefit. When the disease has disappeared, this scientific physician has derived great advantage from a douche of cold sulphureous water in preventing a return of the eruption.

26. 3d. In *treating* the *punctated species* of acne, it will be frequently necessary to press out the accumulated and hardened matter from the follicles. The vapour bath, the warm sulphur bath, followed by frictions either with a coarse towel or a flesh-brush; and lotions such as have been already recommended, or a weak solution of pure potash, or of ox-gall, or of sulphuret of potash, also followed by frictions, are particularly indicated in this species of acne.

27. *Internally*, the solution of the carbonate of potash, or the oxymuriatic acid, advised by Underwood and Willan, may likewise be employed. Sulphur, magnesia, soda, rhubarb, and the subborate of soda, are also of much benefit. Dr. Thomson states, that he has seen the skin completely cleared by the use of the following alkaline tonic for six weeks; at the same time regulating the bowels: —

No. 10. ℞ Zinci Sulphatis gr. xxiv.; Liquoris Potassæ f. ʒ xij. Solve. Sumantur guttæ xxx. ex cyatho aquæ bis quotidiè.

It ought always to be observed, as a general principle, in this as well as in the other forms of acne, that attention to the secretions of the abdominal viscera, and to the general health, by promoting the digestive functions, will of itself, independently of external means, go far in promoting a cure; and that, without such attention, no cure will be permanent.

28. 4th. *The treatment of acne rosacea* is generally unpromising. It should always have a strict reference to the particular nature of the affection of the liver, or digestive canal, or both, with which this eruption is associated, and in many respects symptomatic. A. rosacea often precedes serious disease of the liver, more frequently co-exists with it, and most commonly indicates a congested and obstructed state of the viscus. To this organ, therefore, ought our remedies to be particularly directed. A moderate *blood-letting*; the application of *leeches* on the region of the liver; and, if the eruption occurs in females, and is attended with obstructed or scanty menstruation, leeches also to the upper part of the insides of the thighs, or bleeding from the feet, and stimulating pediluvia, or the hip-bath; the use of *mild mercurials*, or alterative and deobstruent medicines, such as the pills previously prescribed (§ 18.); the blue pill, or the hydrargyrum cum creta with soda and taraxacum; Harrogate, Barège, and other sulphureous mineral waters; the decoction of dulcamara, liquor potassæ, and chlorine or sulphureous fumigating baths; are severally of advantage in some cases. But from none of these will any permanent benefit be derived, unless the regimen presently to be noticed is rigidly observed, and the pathological relations of the eruption appropriately treated.

29. Blood-letting in this, as well as the foregoing species of the eruption, was strongly insisted on by Ambrose Paré; and certainly in the cases pointed out as requiring this practice should never be omitted; more particularly when accustomed discharges have disappeared, as the hæmorrhoidal flux and the menstrual evacuation. In this form of the disease, much advantage will sometimes be procured from the *nitro-muriatic acid* foot-bath; and from a lotion with these acids applied to the affected parts twice or thrice a day (see F. 4, 5.). This practice has received the sanction of MM. Biett, Cazenave, and Schedel. The advantages to be derived from the use of these acids as a lotion will be more certainly secured by applying a few leeches to the vicinity of the eruption, and afterwards a fomentation, which may be followed either by a spirit and alum or zinc lotion, or by

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* Prepared by subliming equal quantities of the corrosive sublimate and murias ammoniæ.

the lotion with the sub-borate of soda (F. 334.). If these fail, the nitro-muriatic acid lotion may be employed. Stimulating and irritating applications ought to be avoided; and whilst the tone of the digestive organs and the secretions of the liver should receive the closest attention, drastic and cold purgatives are to be avoided.

30. 5th. The *treatment of the syphilitic* or specific form of acne must be directed as in other states of secondary venereal disease. At the same time, however, that the mercurial preparations are being exhibited, the external means which have been recommended may be employed, according to the particular form the acne may assume. The mercurial preparations should be combined with sarsaparilla or taraxacum, or both, and with small doses of antimony. The decoction of Feltz, which chiefly consists of a combination of these remedies (see F. 588.), is much employed in these eruptions on the Continent, and may be taken to the extent of a pint and a half daily. When the tubercles remain long, the ointments formed with the iodurets of mercury or sulphur (F. 774, 775.) may be employed twice daily, and assisted by douches of vapour.

31. The *diet and regimen* of persons affected with acne, particularly the A. rosacea, ought to be carefully restricted. In the A. simplex, indurata, and punctata, the diet should be light, nutritious, and easy of digestion. Cold, raw, and indigestible vegetables, particularly cucumbers and melons, and very cold fluids, should be avoided. Moderate and regular exercise in the open air, and early rising, as tending both to promote digestion and invigorate the frame, are always of service. In the *acne rosacea*, more will often depend upon regimen, than upon the medical treatment of the patient. The careful avoidance of all its exciting and concurrent causes, and of excesses of every description, both in eating and drinking; the adoption of a mild farinaceous diet, with a small portion only of light and nutritious animal food, and of toast-water or barley-water for drink; shunning mental excitement and depression, as well as heating and fatiguing exertions; gentle and regular exercise, and attention to the promotion of the secretions and functions of the abdominal viscera; are essentially requisite to the removal of this very obstinate and often unconquerable eruption.

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ADHESIONS. Syn. *Adhésions, Adhérences,* Fr. *Die Anhünglichkeit*, Ger. *Congiunzioni, unioni, aderenzæ*, Ital.

Classif. Morbid Structure. — Therapeutics. Chiefly a result of some one of the *Inflammatory States*. — See Inflammation.

1. *Adhesions* of opposite surfaces of tissues are amongst the most common organic lesions presented to our view in post mortem examinations. They may be congenital, arising either from an original disposition of parts, or from intra-uterine disease. As they are commonly brought before us in practice, they are generally one of the consequences of inflammatory action, affecting the adhering surfaces, or which had affected them previously; and occur in those parts which are in contact, or so nearly in contact, that the effusion of a common product of the inflammatory act becomes the medium of union.

2. It is requisite to all adhesions, that a fluid be thrown out from the inflamed surface, previously to the adhesion being commenced. This fluid varies somewhat in its characters with the state of inflammatory action; but it soon passes into a much more consistent condition, and thus becomes the medium of adhesion. In some places it is scarcely perceptible between those parts of opposite surfaces which are naturally very nearly or altogether in contact with each other, the agglutinating medium being there so remarkably thin; whilst those parts that are further separated in their natural state, have the interstices filled up by a copious exudation. The fluid exuded in thus variable quantities, has been denominated, in its first stages, or inorganised states, coagulable and coagulated lymph, albuminous exudation, coagulated albumen, &c. When first poured out from the inflamed surface, particularly of serous membranes, it consists of a lymph-like fluid, which soon becomes somewhat opaque, more solid, and assumes the appearance of a softly coagulated albumen, — its chemical properties very nearly approaching to those of pure albumen, containing a small proportion of the usual saline ingredients of the blood.

3. The longer this matter has been effused, and the longer adhesions, which it has occasioned, have endured, the more firm and more closely resembling cellular or cellulo-fibrous tissue do they become. This change in the state of the adhesions, according to their duration, is fully stated in the article on the morbid states of *serous membranes*. It may, however, be here premised, that the medium of adhesion, which is first fluid, and afterwards albuminous and nearly solid, soon becomes partially organized; blood-vessels shoot into it, and thus opposing surfaces become more or less firmly united, according to the degree of motion occurring between them, that may either prevent their firm adhesion, or disturb it after it has been already formed, and to the state of the fluid which becomes the medium of union. In some cases this fluid is secreted so copiously, and is so deficient in the albuminous constituent, the watery part being so predominant, that adhesions are formed only in different, or in numerous and irregular points, between which serum in various states is effused, separating the opposite and partially united surfaces, stretching the adhesions, breaking down some, and reducing others to cellular bands running between these surfaces through the effused fluid, which is in such cases usually very turbid, and abounds in flakes of albuminous matter. This appearance is not unusually observed in cases of adhesion of the pleura, pericardium, and occasionally of the peritoneum.

4. The concrescible fluid, as will appear in the sequel, which is formed between the surfaces of divided structures, originates in two distinct modes, generally assumes a firmer and more fibrous character in its advanced stages, and undergoes a more marked diminution of volume than is ob-

served in those adhesions which form on serous surfaces. From this it will be apparent that adhesions are formed by the medium, 1st, of a concrete inorganic albuminous matter; and 2d, of this matter, at a later period, in a more or less organised state, and presenting various appearances, according to the length of their duration, and the nature of the inflammatory disease which produced them. It will be also apparent, from the foregoing, that the adhesion of opposite surfaces is not in itself a specific disease, but the result of disease, — generally of inflammation in some one of its grades.

5. Adhesions, in respect of their ultimate tendencies, are either *reparative* or *morbid*. M. Cruveilhier, who has divided them in two classes, according to this view, comprises under the former the adhesions between divided tissues and surfaces brought about by surgical aid; to which I may add those that take place around purulent formations, and prevent the extension or effusion of the collected matter into adjoining parts. Whilst the reparative class of adhesions are stated to form generally between divided structures and diseased surfaces, it should be kept in recollection that all the tissues do not admit of adhesion taking place immediately between their divided surfaces. Blood-vessels, nerves, muscular fibres, and tendons do not unite after division. It is the minute vessels of the cellular tissue which surrounds them, and their individual fibres, that chiefly furnish the means of their adhesion. From these vessels, if protected from the atmospheric air, a coagulable lymph is thrown out; which gradually becomes vascular, organised, and in a few days cellulo-fibrous, and as firm as the parts which formed it. This newly produced substance is the medium by which the muscular fibres, or other structures which had been divided, are united; and this gradually becomes thinner and less apparent, and admits of the nearer approximation of the separated parts, until they at last seem continuous, although the existence of the medium of union may still be detected. This constitutes *primary* adhesion, the union by the "*first intention*" of surgeons.

6. When the division takes place between bones, this exudation forms the callus, into which ossific matter is deposited. Some pathologists believe that the concrescible lymph, thus furnished by the capillary vessels of the divided surfaces, particularly those of the cellular tissue, is the matrix, in which the peculiar structure, of which nerves or muscular fibres consist, is afterwards formed or deposited. But, if this were the case, the firm, and even fibrous, matter into which the medium of union is ultimately changed would at last disappear, and these structures be actually continuous. This, however, never unequivocally occurs; for, although the uniting medium is reduced to a very thin, and scarcely perceptible, substance, yet it may be made apparent by maceration and careful dissection.

7. When air is admitted between the divided structures, or when primary adhesion fails of taking place, a different process obtains; minute granulæ or carunculæ form upon their surfaces, whence proceeds at first a fluid pus, subsequently a more concrescible fluid, which forms a sort of false membrane, and which, when the opposite surfaces are kept in a state of near approximation, becomes the medium of adhesion, unless the state of the system is such as not to admit of the formation of this concrescible fluid, and of the other steps of this restorative process. When divided parts come in contact with the air, the adhesion is always formed in this manner, — by the suppurative process, whatever may be the nature of the structure which is thus circumstanced; and the false membrane, which is the medium of union, becomes more thin, firm, and fibrous, and, at the same time, less apparent with the lapse of time. This may be called *consecutive* adhesion. When the divided surfaces are protected from the air, and primary adhesion takes place, the process is more rapid; but its quickness will depend upon the quantity of blood effused between the divided surfaces. If this be considerable, one of two things will result, — either the effused blood will be absorbed, and a cyst, or cellulo-fibrous medium of union, be slowly formed, which will be gradually diminished in thickness; or the coagulum may act as a foreign substance, keep up irritation of the vessels in the divided surfaces, cause suppuration, and consecutive adhesion, with the cicatrix formed by the medium of union. (See art. Abscess.)

8. There is one important point connected with adhesions in their various states and seats, — whether *reparative* or *morbid*, whether *primarily* reparative or *consecutively* reparative, and whether taking place between cellular, serous, or other structures, — which has not received the attention from modern pathologists that its practical importance requires for it, and to which John Hunter first directed notice. I allude to the important truth, that adhesions of either of the above descriptions, but particularly the primary reparative, whether taking place between divided surfaces or around purulent formations, either will not form, or, if in the process of formation, will be dissolved, in certain states of the vital energies of the frame, and of the circulating fluid. Great depression of the vital influence will have this effect, whether it be produced by the exhaustion proceeding from profuse discharges, by contagious and other noxious miasms, by the close air of hospitals, and other places loaded with animal effluvia, by the inoculation of certain animal poisons, by the absorption of puriform or sanious secretions, or other morbid matters, into the current of the circulation, by the mercurial affection of the frame, or by the gouty diathesis. When the vital energies of the frame are greatly depressed, and the tonic action of the capillaries much relaxed, by causes acting either extrinsically or intrinsically as respects the blood-vessels, the ability of throwing out a concrescible or coagulable lymph from the divided or inflamed vessels is destroyed, and in its place is produced an ichorous serum, or sanious fluid, which may either pass out, or, if no ready outlet is afforded, will infiltrate itself through the tissues adjoining, or be partially absorbed and vitiate the perhaps already morbid blood. (See art. Blood.)

9. In order to prevent this very dangerous state from supervening in all cases where the reparative process of adhesion is required, the utmost attention ought to be devoted to the state of the vital energies, particularly as indicated by the tone and frequency of the pulse, and the states of the digestive organs. When the former becomes

very quick, and the powers of the latter fail, that much dreaded state of the frame, which is insufficient for the formation of coagulable lymph, may be considered as approaching, if it be not actually present. In all cases where blood-vessels are liable to be inflamed, this state of the constitutional powers, owing to the risk of the blood being vitiated, is particularly to be guarded against. Having advanced as much as belongs to my province respecting the reparative states of adhesion, I proceed to state briefly the doctrine of *Morbid* adhesions. The particular morbid adhesions are noticed under the articles on the pathology of the parts in which they form.

10. Adhesions in some one of the states described above (§ 1—4.) are liable to occur, as a consequence of certain grades of inflammation, in the following situations: — 1st, In the cellular tissue; 2d, between serous surfaces; 3d, between mucous surfaces; 4th, between synovial surfaces; 5th, in the internal surface of blood-vessels; and 6th, between the surfaces of morbid or accidental formations.

11. *A. Adhesions of cellular tissue.* — The first step of the process is the exhalation of a quantity of yellowish serum and of coagulable lymph into the cellules of this tissue, which ultimately agglutinates them together, upon the absorption of the former, and the concrescence of the latter. The consequence of this is, that the product of inflammation formed in the centre of the inflamed cellular tissue, consisting chiefly of the more fluid and least concrescible portion of the exhalation, is prevented from permeating the agglutinated cellules, and a barrier is set up against it. If resolution takes place and the purulent matter is absorbed, the surfaces of the cavity become united, and the medium of union is changed, as in cases of recent wounds, and in the manner described above (§ 5.). If the parts go on to the evacuation of the matter, adhesion is also effected, as in the cases of *consecutive* restorative adhesion (§ 7.); leaving, however, a cicatrix, which is gradually diminished, formed of the cellulo-fibrous medium of union. In all cases of inflammation of cellular tissues, adhesion of the cellules, from the exudation of a concrescible lymph, takes place; and it is this adhesion which forms the fibrous cysts to abscesses, isolates their contents from the surrounding structures, and in some respects excludes them from the economy. Adhesions of the cellules of this structure also strengthen the cysts of aneurisms, and form sero-fibrous cysts around foreign bodies that are accidentally lodged in it.

12. *B.* Adhesions between *serous surfaces* are the next most common; being formed through the medium, either of a more or less thick and firm inorganic albumen, in the form of a false membrane, or of this substance advanced to a more or less organised state, and assuming either the appearance of cellular tissue, with a surface partaking of the serous character, or one of the states about to be noticed. The organised nature of those adhesions has been denied by some; but the observations of Stoll, Hunter, Dupuytren, Baillie, Meckel, Home, Lobstein, Cruveilhier, Gendrin, Baron, and others, who have traced blood-vessels in them, have put the question at rest. Adhesions occur most frequently between the pleuræ, next in the peritoneum, and next to these in the pericardium. They are comparatively rare in the tunica vaginalis; and in the arachnoid they are still more rare.

13. It is not necessary to the formation of adhesions between opposite serous surfaces, that the pre-existing inflammation shall extend continuously to both. When the coagulable lymph is thrown out upon one of the two inflamed surfaces, — as, for instance, of the peritoneal surface of the small intestines, — it seems to act as an irritant to the opposite part of the omentum, with which it is brought in contact, inducing inflammation of that part only, and leaving the intervening surface both above and below it unaffected. The part thus irritated by the contact of the coagulable lymph, poured out by the part primarily affected opposite to it, becomes also inflamed, and exudes this concrescible fluid; and the inflammation thus secondarily induced in a part of the omentum may advance to the external surface of the omental duplicature, and, by means of the exudation of this product of inflammation in that situation, excite a similar state of action in the directly opposite part of the peritoneum reflected over the abdominal parietes. Thus the inflammation and its consecutive adhesions may proceed, without the disease having affected any of the continuous surfaces intervening between them. A similar circumstance is sometimes observed in respect of the convex surface of the liver and peritoneal surface of the diaphragm. Inflammation, commencing in a part only of the former, will excite it in the part of the latter exactly opposite, and be followed by adhesion; and the inflammatory action, not infrequently extending upwards through the diaphragm to the diaphragmatic pleura, will be further followed by the exudation of coagulable lymph on its free surface, which, irritating that portion only of the pulmonic pleura opposite to, or in contact with it, will inflame that part, and form adhesions with it, without affecting the continuous surface intervening between, and surrounding the adherent parts. The unadhering cavity, however, not infrequently contains a turbid or flaky serum, with patches of false membrane, arising from a less acute state of inflammatory action in those parts of the serous surface immediately adjoining the adhesions. Thus it is not unusual to find, in cases of acute inflammation affecting either the peritoneum, pleura, or arachnoid, and limited to a particular part, a similar state of disease, and the same product, formed only in the parts opposite, and most nearly in contact; whilst the continuous surfaces surrounding them are either altogether sound, or much less affected; — most commonly only so far as to give rise to a serous exudation, or slight albuminous coating in their immediate vicinity.

14. From this it will appear, that the near approach, and more especially the immediate contact of opposite surfaces, and the want of motion between the one surface and the other, will favour the formation of adhesions: thus they are most frequent at the superior parts of the pleura, between the convex surface of the liver and the diaphragm, and the serous surfaces of parts included in Herniæ. The different species of media, by which adhesions of serous surfaces are affected, are the following, according to M. Cruveilhier: — an inorganised false membrane; a filamentous adhesion, and a cellular adhesion,

in neither of which blood-vessels are evident; a permanent organised membrane; and a tuberculated membrane. All these originate in a concrescible lymph, as in adhesions of cellular tissues. (See art. on SEROUS MEMBRANES.)

15. *C.* Adhesions between *mucous surfaces* are not frequent. BICHAT denied the possibility of their occurrence, unless destruction of the mucous membrane had taken place. He was led to this conclusion more by the functions of this membrane in health and disease, than by observation of facts. There can be no doubt, however, that the opposite surfaces of canals, covered as they are by mucous membranes, occasionally adhere, in consequence of very acute attacks of inflammation; but this occurs very rarely, owing to the access of atmospheric air, to the presence of gases, to the various matters constantly passing through them, and to the nature of the fluid which usually proceeds from inflammation of these surfaces. The most common exception which takes place to the general inference adopted by BICHAT is met with in the vagina. I have observed several cases, at the Infirmary for Children, where adhesions of the opposite surfaces of this canal had taken place in consequence of inflammation,—some of them at so early a stage, that they were removed by merely forcibly separating the adherent surfaces, when the mucous membrane was found perfectly entire, but highly inflamed, and covered by an exudation similar to that which is thrown out upon inflamed serous membranes. Similar facts are recorded by MM. DUPUYTREN, VILLERMÉ, BRESCHET, and CRUVEILHIER. Adhesion also of the *os uteri*, as a consequence of inflammation, is sometimes observed. Occlusion of the Fallopian tubes, and even the adhesion of the opposite internal surfaces of the uterus, have been occasionally met with. WALTHER, RENAULDIN, and MECKEL observed these changes so often in prostitutes, that they attributed them to the frequent irritation of the parts, and imputed the barrenness of these females partly to this cause. But, in the cases of occlusion of the Fallopian tubes, more is to be imputed to the accumulation of an inspissated or albuminous mucus, the product of inflammation, which, from its tenacity and consistence, cannot flow along these tubes, than to actual organised adhesion of their opposite surfaces. The occasional occurrence of obliteration of the canals of the common bile-duct, and of the ureters from the impaction of a calculus, seems to proceed from the irritation and abrasion occasioned by calculi, and the consequent exudation of a concrescible fluid, which agglutinates their surfaces, and ultimately tends to reduce them to a cellulo-fibrous cord.

16. Adhesions are either never met with in the air passages, or so rarely, as to render their actual occurrence doubtful. I believe that, although albuminous concretions are occasionally formed in the bronchi, and frequently in the trachea and larynx, &c., they cannot be so produced as to give rise to adhesions of the opposite surfaces. They never, or at least very rarely, become organised; and, although they may completely obliterate the canals of several of the bronchi, they cannot have this effect on the trachea without causing immediate death. The organisation and form of the larger air-tubes completely prevent their adhesion; although they are often nearly filled up with concrete albuminous formations, as a consequence of certain states of inflammation. Adhesions of the internal surface of the œsophagus, or of any other part of the digestive tube, are never met with; although constriction, with thickening, &c. to the almost entire obliteration of this canal, is not infrequent. As in the air passages, nature has made in the functions, during health and disease, of the membranes which line them, sufficient provision to prevent this lesion from occurring. And we uniformly observe, when inflammation attacks any portion of those tubes, the preservation of the canal of which is essential to life, that, although a copious albuminous exudation will sometimes occur, its organisation will generally be prevented, and its detachment from the surface on which it is formed will be secured, sooner or later, by the secretion of a more fluid, or mucous, or muco-purulent matter underneath, which loosens the concrete albuminous coating or false membrane from its attachment to the surface on which it is formed. The circumstances which chiefly seem to favour the formation of adhesions between mucous surfaces, are: 1st, The abrasion of the epidermis which covers them; owing to which their secretions are changed, and they partake more of the characters of cellular tissue. 2d, Entire destruction of the mucous membrane in a great part, or the whole, of the circumference of a canal, favouring its gradual constriction, suppuration, and ultimate obliteration. The bile-ducts, ureters, urethra, rectum, and œsophagus occasionally furnish proofs of this change in some one of its stages. (See art. on MUCOUS MEMBRANES.)

17. *D.* Adhesions of the *synovial surfaces* of joints are rarely observed, excepting in cases of anchyloses, of which they cannot be considered even as the commencement, although they may accompany the earlier stages of this change, particularly in anchyloses consequent upon rheumatism. Many, however, of the alterations which take place in the synovial apparatus of tendons are consequent upon their adhesion and obliteration. Inflammation occurring in them primarily, or extending to them from contiguous parts, is generally followed by their adhesion, and reduction to a state of dense cellular tissue. Hygroma almost always terminates by adhesion.

18. *E.* The adhesion of the internal surface of *blood-vessels* takes place through the medium of the coagulated lymph secreted by the inflamed vasa-vasorum. The vessel becomes impervious in consequence of this exudation, which is poured out in the form of a false membrane from its internal surface. The lymph which is exuded, particularly when its coagulable or concrescible property is well marked, frequently produces coagulation of the blood in contact with it; so that, generally, the obliteration is occasioned both by this lymph, and the coagulum of blood which it occasions. In a short time the coagulum thus formed within the inflamed blood-vessel becomes more and more pale and dense, sometimes partially organised; and, as its density is increased, so is its bulk diminished: the coats of the vessel, at the same time, lose their specific characters; they seem constricted around the substance formed within them, the middle coat becomes less distinctly fibrous, and at last they are reduced to the state of a cellular, or fibro-cellular, chord.

This may be viewed as the primary form of their adhesions, and its usual results. When, however, suppuration takes place in their internal surface, the adhesion is formed consecutively in the manner described above (§ 7.); or the primary may pass into the consecutive form of adhesion, particularly when the false membrane is insufficient to fill up the entire canal of the vessel.

19. Adhesions take place more readily in veins than arteries; are produced in both, and in lymphatics also, in the manner now stated, generally in consequence of inflammatory action, attended with sufficient power of the constitution to form concrescible lymph (see the articles on Arteries and on Veins); and sometimes, even after a very slow and slight grade of this action, when the opposite surfaces of the vessels are pressed together by any tumour existing exteriorly to them. When artificially excited in arteries, as by the application of ligatures, the inflammatory state which produces the adhesion is not so prone to extend along the axis of the vessel, or to occasion dangerous effects, as when it is excited in the same way in veins. When thus produced in these latter vessels, fault of constitution, an unhealthy habit of body, unwholesome state of the atmosphere, &c., or the other causes above assigned (§ 8.), will generally interfere with the process, and occasion that state of morbid action, and of its products, which will vitiate the current of the circulation, and even destroy life. (See Veins — *Inflammation of*.)

20. *F.* Adhesions of the internal surfaces of cysts, and other morbid formations, sometimes take place from a consecutive state of inflammation extending to them. Large cysts, which in consequence of their situation cannot be removed, may be obliterated by their puncture, and the production of inflammation of their internal surfaces, so as to procure their adhesion.

21. *G.* Adhesions may also form between parts of the cutaneous surface, when deprived of the cuticle, and kept in close contact. This is not infrequent after scalds and burns, and is produced in a similar manner, as I have explained, in respect of adhesions taking place primarily, and without suppuration, or subsequently to the occurrence of this process in the cellular and mucous tissues. Adhesions also occur in other situations, as between the iris and capsule of the crystalline lens, &c.; but I have noticed those which more especially belong to my province.

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ADIPOSE TISSUE. *Tela adiposa*, Lat. *Tissu graisseux*, Fr. *Das Fett*, Ger. — Its Morbid States.

Classif. IV. Class, IV. Order (*Author*, see *the Preface*).

1. The adipose substance is frequently either *diminished* or *increased* far beyond the healthy standard. — *A.* Excessive diminution of this substance, *atrophy*, occurs naturally in very aged persons; and there seems to be, even in early life, a tendency to it hereditarily in certain constitutions, particularly in those of a peevish, anxious, and irritable temper. It is often met with as a consequence of, or conjointly with, pulmonary and other organic diseases, particularly those which interrupt assimilation and the supply of nutrition. But it is also a symptom of all diseases which impair the vital energies by morbidly increasing the secretions and evacuations: as in diabetes, diarrhœa, and dysentery. It also necessarily proceeds from long abstinence, &c.

2. Atrophy of this substance may be temporary or permanent. It is usually the former in early or middle life, and continues merely as long as the causes which occasioned it. It is usually permanent in advanced life, and in those of an active, peevish, restless disposition. In every case the removal of the fatty matter is produced by absorption; and, according to the experiments of Magendie, Tiedemann, Gmelin, Mayer, &c., this process may be ascribed, at least in part, to the minute veins. The circumstance of fatty and oily matter being constantly found in the blood, but in variable quantity, as shown by Trail, Babington, Le Canu, &c., seems to support this view; for, if taken up by the absorbents, it may have been changed or assimilated in its passage through the absorbent glands before it could have reached the blood.

3. *B. Excessive deposition* or *hypertrophy* of this substance (*adiposis*) is very common, affecting the body generally, but sometimes locally only. Persons have weighed as much as 500 or 600 lbs. owing entirely to this state of hypertrophy. This tissue is naturally abundant in females and eunuchs. Its hypertrophy is frequently occasioned by excessive venereal indulgences, particularly in early life, and when conjoined with high living and indolence. It generally is attended by a weak languid circulation, weak digestion, with craving appetite, defective secretions and excretions, and disinclination to active mental or physical exertion. It also evinces a marked hereditary character. Full living, particularly on food which abounds with the elements of the fatty substance, as sugar, spirituous and malt liquors, &c. tend greatly to promote it. The connection of this morbid state with deficient assimilation appears fully proved. It would seem that in persons whose vital energies are diminished, whilst the appetite remains unimpaired, or is excited by stimulating liquors, &c., the sanguifaction of chyle does not take place so rapidly nor so perfectly as in health; that a large portion of this fluid assumes an oily or fatty character, and is deposited in the adipose tissue, which thus becomes one of the emunctories of the frame, in which a substance that cannot readily be carried out of the circulation by any other organ is set apart for the purpose of future absorption, assimilation, and nutrition, as the wants of the system may require, and to prevent its hurtful accumulation in the circulating fluid. Thus, in persons otherwise apparently healthy, the excessive accumulation of fat is often one of the earliest and most remark-

able signs of diminution of the vital energies of the frame. (See Art. OBESITY.)

4. *C.* In many instances, when the powers of the constitution are either greatly reduced or otherwise perverted from the healthy state, the adipose matter is also changed in *colour*, *composition*, and *consistence*, becoming remarkably pale, or dark, reddish, or gelatinous. It may likewise be, particularly in cachectic persons, uncommonly watery, soft, smeary, or jelly-like; and, on the contrary, but more rarely, hard, waxy, or even horny.

5. *D.* It may be a question whether or not this tissure is liable to *inflammation*. Considering it merely as a modification of the cellular structure, chiefly in as far as it contains the fatty substance of the body deposited in its areolæ, the containing tissue only must be looked upon as that which is liable to inflammation or any other disease; the fat or contained matter being entirely passive, and modified only by the morbid states of the tissue which secretes and contains it. There seems little doubt that the adipose tissue participates in the various states of diffuse inflammation; whether that attending upon certain forms of erysipelas, or following accidents, or the inoculation of morbid matter. When thus inflamed, it rapidly passes into a state of sloughy and fetid suppuration; large portions of it being not unfrequently converted into an ash-coloured, semifluid pulp, mixed with shreds of cellular tissue and albuminous matter, or becoming entirely sphacelated.

6. *E. Effusion of blood* into the adipose tissue occurs under similar circumstances to those connected with hæmorrhage into the cellular substance, but much less frequently. This change has been occasionally noticed by HUXHAM, CLEGHORN, CRAIGIE, and by myself and others, in scorbutus, purpura hæmorrhagica, and in the liquescent or malignant forms of remittent fever in warm or unhealthy climates.

7. *F.* Of the *tumours* most frequently developed in this tissue, the most remarkable are, — *a. adipose sarcoma*, which is surrounded by a thin capsule of cellular tissue condensed around it, and consists of an unusual accumulation of fatty matter in cells, the component fibres of which are so firm as to give consistence to the tumour: it closely resembles a local hypertrophy of the adipose tissue, excepting that it is surrounded by a capsule; and it may have either a broad or narrow base: *b. steatomatous* tumours are chiefly a peculiar modification of the fatty secretion, which is accumulated in masses, surrounded by a spheroidal cyst: they are not formed of cells, in which the fatty matter is deposited, but consist of a simple semifluid substance secreted by the inner surface of the cyst: they occur more frequently in the cellular, than in the adipose tissue: *c. atheromatous* and *melicerous* tumours are either modifications of the steatomatous, or proceed from the change induced in small chronic abscess; but they are most commonly the former when seated in this tissue.

8. *G. Melanoid* deposition is sometimes found in both the internal and external adipose substance. It may be either disseminated in the form of small inky spots, or accumulated in spheroidal masses; or found in a semifluid state and brownish-black colour, surrounded by a cyst formed by the condensation of the contiguous cellular tissue. As to the state in which this peculiar matter is formed, great diversity of opinion exists. LAENNEC supposed that it is first secreted in a solid form, and, like tubercular deposits, afterwards becomes soft. I am, however, inclined to adopt the opposite opinion; viz. that it is secreted in a fluid or semifluid state, and that it afterwards becomes firm by the absorption of its more fluid parts. The observations of DRS. CULLEN and CARSEWELL, and of M. CHOMEL, seem to confirm this opinion.

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AFTER-PAINS. SYN. *Parodynia Secundaria Dolorosa*, Good.

CLASSIF. 5. *Class*, 3. *Order* (*Good*). II. CLASS, III. ORDER (*Author*).

1. DEFIN. *Pains, more or less severe, either continuing or supervening shortly after the expulsion of the placenta in child-birth.*

2. SYMPTOMS and DIAGNOSIS. Attacks of pain in the abdomen are usually experienced in the early part of the puerperal state. They proceed, when very severe, from the contraction of the uterus, irregularly excited by the presence of coagula. They usually soon follow delivery, are least severe after a first labour, are increased upon the application of the child to the breast, and last for a day or two. They are generally aggravated by flatulence and costiveness.

3. It is extremely requisite for the young practitioner to be on his guard respecting the nature and seat of pain after delivery, as the commencement of the most fatal diseases to which the sex are liable may be mistaken, if not carefully observed, for after-pains. These latter are the result of the natural contractions of the womb, and of its return to its former state; and are distinguished from disease, particularly inflammations of the uterus, ovaria, or pelvic peritoneum, by their remissions, and by the absence of tenderness or tension of the abdomen, especially on pressure. The uterine discharge also is not obstructed; the milk is secreted; there is no shivering nor vomiting; and the pulse is seldom increased in frequency.

4. When the patient's bowels have been neglected previously to confinement, and when much flatulence exists, the after-pains are often *complicated* with *colic*, or they assume a *colicky character*. In cases of this kind the abdomen is often somewhat more tense and distended than usual; the fits of pain are severe, with complete remissions; the patient complains of flatulence; the bowels are constipated: but the pulse is not much affected; the skin, particularly of the trunk, is not hot; the tongue is moist; and the feet are often cold; in a few cases there is retching. It is important to attend carefully to the character of pain consequent upon delivery, and to consider it in relation to the attendant symptoms, particularly the states of the pulse, and of the abdomen. We ought, therefore, to enquire into its exact seat, examine the pained part carefully with the hand; and, having ascertained in what manner it is affected by the examination, we readily arrive at just conclusions as to its nature. When it is felt in the regions of the uterus and ovaria, and accompanied by great fre-

quency of pulse, disorder of the lochial discharge, tenderness, and fulness of the hypogastric region, &c. the existence of the inflammatory diseases of the uterus, and of its appendages, are to be inferred. If it be complained of about the groin, it may be the forerunner of phlegmasia dolens; and if it be felt about the hip, or in the muscles of the pelvis, abdomen, or thighs, it may be rheumatic, owing to the application of cold in some form or other. The pains of rheumatism are readily recognised from their seat, their aching or gnawing character, the manner of their affecting the motions of the part, and the attendant symptoms. The diagnosis, however, of these diseases is fully pointed out under their respective heads.

5. Treatment. The exhibition of an anodyne, with attention to the state of the bowels subsequently, has generally been considered sufficient for the relief of after-pains. In the more severe cases, an anodyne liniment has been recommended to be applied to the abdomen, in addition to the exhibition of a dose of laudanum internally; and in protracted cases, Dr. Burns advises a purgative — certainly the best part of the treatment usually resorted to. I am, however, of opinion, from remarking the results of this practice, that the common or less urgent cases would have been better left to nature; and that friction of the abdomen merely with any of the liniments in the Appendix (F. 297, 298.), or friction followed by a purgative, or an enema, is all that is necessary. We ought to recollect that these pains are merely the result of the healthy tonic contractions of the uterus upon the congested veins, and the coagula remaining in it, occasioning their expulsion, and the discharge of the blood accumulated in its sinuses; and that the more effectually these ends are accomplished, particularly in unhealthy situations, and lying-in hospitals, the less risk will there be of the occurrence of dangerous forms of puerperal disease.

6. Whilst, however, anodynes allay the morbid sensibility of the uterus, they tend to diminish its tonic contraction, to induce a congested and relaxed state of its parietes and mouth, and to favour the admission of air into its cavity. Air, when admitted, particularly under certain circumstances, is productive of the most dangerous results, from its effects upon that portion of the surface of the womb to which the placenta was attached. Impressed with the justness of this view, I have usually recommended frictions with liniments over the region of the uterus, and a purgative, or purgative injection, which will tend essentially to favour the contraction of the uterus, and the expulsion of the cause of irritation.

7. In cases complicated with flatulency and colic (§ 4.), the above means are still more requisite; but much will depend upon the choice of purgatives. My own experience, derived entirely from consultation, is decidedly in favour of a draught, consisting of half an ounce of the oleum terebinthinæ, combined with the same quantity of oleum ricini; or an enema, containing the same medicines. The combination, also, of a purgative with assafœtida, or any other antispasmodic, and an injection, consisting of infusion of valerian, or containing assafœtida, with a due proportion of any aperient medicine (see F. 130. 135. 138.), will seldom fail of giving relief, by removing flatus, and promoting the restoration of the uterus to its natural state. In the more urgent cases, anodynes may be conjoined to the foregoing means; for, when thus associated, they will not act in preventing the contractions of the uterus. (For Hysteralgia, and the various diseases of the uterus in the puerperal and unimpregnated states, see Uterus.)

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AGE. Syn. *Ætas*, Lat. *Das Alter*, Ger. *Age*, Fr. *Eta*, Ital.

Classif. — Pathology and Therapeutics.

1. In the succinct view I purpose to take of the pathological and therapeutical indications which this subject will naturally suggest to the mind of the practical physician, I purpose, *first*, to sketch the successive epochs of life, and thus consider the word in its *generic* acceptation. When I arrive at those periods of existence to which the word *age* is specifically applicable, the changes which take place in the human frame, in respect both of organisation and function, with the advanced progress of years, — with age in its *specific* acceptation, will be fully stated, as furnishing important data for practical indications in the treatment of diseases of this epoch.

2. Of Age in its generic Acceptation, — *or different Epochs of Life*. Before I proceed to consider the subject in its enlarged point of view, I may briefly advert to the periods into which the usual natural duration of human existence may be divided. Without occupying my limits with the divisions adopted by ancient and modern writers, I shall adopt that arrangement of the different epochs of life which has been suggested to my own mind, from observing the varying manifestations of life and function, and the modifications of diseased action with advancing age. The division which I have thus adopted may require more to be said in support and illustration of it, particularly in respect of its physiological relations, than I am willing to advance on a subject which may be considered as nearly verging on the speculative. Leaving, therefore, out of sight many of the physiological and psychological views, which would arise out of an extended investigation of the subject, I shall merely briefly advert to topics of practical importance; — those which concern the medical jurist fall not within the scope of this work. (For epoch of *fœtal life*, see Fœtus.)

3. Before proceeding to consider the different periods of age individually, it may be useful to exhibit a view of the arrangement I intend to follow: —

I. Period, or *that of Infancy*.
    1st *Epoch*, to the commencement of the first dentition.
    2d *Epoch*, from the commencement, to the completion of the first dentition.
II. Period, or *that of Childhood*.
    Extending from the completion of the first to the completion of the second dentition.
III. Period, or *Boyhood — Girlhood*.
    From the seventh or eighth year to the commencement of puberty.

IV. PERIOD, or *Adolescence*.
  Commencing with the first appearance of puberty, and extending to adult age.
V. PERIOD, *Adult Age*.
  1st *Epoch*; or early adult age, or confirmed virility.
  2d *Epoch*, or mature age.
VI. PERIOD, *Declining and Old Age*.
  1st *Epoch*, declining age.
  2d *Epoch*, green old age.
  3d *Epoch*, advanced old age, ripe old age.
  4th *Epoch*, decrepitude, second infancy.

4. I. PERIOD, or that of INFANCY, (*Infantia*, from the privation of speech,) commences with birth, and extends to about the end of the second year, when the first dentition is completed. It may be divided into two epochs; the *first* beginning at birth, and extending to the sixth or seventh month, when dentition is fully commenced; the *second* proceeding from this age to the end of the period, the completion of the first dentition, when the relations of the young being with the external world are fully established by the developement of the sensorial and locomotive organs.

5. *A*. During the *first* epoch, or that preceding the commencement of dentition, all the structures are merely in the course of developement; particularly the osseous system, the cerebro-spinal nervous system, and the organs of locomotion. The functions are only acquiring activity, and several of them have not yet appeared. The vital phenomena gain strength, whilst certain of those functions, by which the young being is to hold converse with the objects around him, either begin to dawn, or have not yet merged into existence. The manifestations of life are chiefly vegetative, and the movements automatic. The *attitudes* are generally without variety, and the changes of the countenance express merely pleasure and pain to the spectator; but, to the medical observer, they convey important information, and often all that he can obtain respecting the maladies incidental to this period of life. At this epoch, the position of the limbs, the character of their motions, the cry, and its numerous varieties; and especially the changes of the countenance; the state of the eyes and eye-lids; the openness, contraction, &c., of the eye-brows; the appearance of the lips and nostrils; of the mouth, gums, and tongue; — all furnish means of ascertaining the nature and progress of disease.

6. *a*. At this age the organs of digestion are unsuited to any other food than that derived from the breast of the mother; and so little capable are they to assimilate any other, even of the blandest and most digestible kind, or the milk of other animals, that very few, not more than one in six or seven, ever arrive at the more advanced periods of life who are deprived of the kind of nourishment nature intended for this epoch. At this age the system is extremely susceptible of external impressions acting upon the lungs, surface of the body, and digestive organs; and particularly to the influence of cold. Recently removed from a constant and unvaried warmth, and having heretofore existed with all the mucous surfaces shut from the action of foreign agents, the young infant imperatively requires to be preserved, particularly during the first months of this epoch, from the influence of a low range of temperature, and from its sudden changes. The disposition to increased action in all the mucous membranes, and the great susceptibility of the respiratory nerves, require the surface of the body, and particularly the organs of respiration, to be guarded from atmospheric vicissitudes; the chief source of the diseases which are so prevalent and fatal at this age. A similar susceptibility of the digestive mucous surface also exists, and is but too frequently evinced by the slightest change in the milk of the mother, or addition of articles of food unsuited to the state of the digestive organs. Much of the mischief, however, which improper ingesta are calculated to produce is guarded against by the copious secretion of mucus, with which the internal surface of the stomach and bowels is covered, particularly in very early life.

7. The susceptibility of the mucous tissues to stimuli and irritants, and their proneness to inflammatory action at this age, extend also to the cutaneous surface, as shown by the frequency of acute exanthematous diseases, and of chronic eruptions. The intimate sympathy existing between both these structures is very strikingly evinced, by the frequent association of inflammatory excitement of the mucous surfaces, particularly of the digestive canal, with a similar affection of the skin. The co-existence and close connection of inflammatory irritation of the digestive mucous surface, and an analogous state of disease of the brain and its membranes, or the supervention of the latter on the former, are also often observed. During the first months of existence, vascular action in the brain is prominently developed, and engaged in perfecting the organisation of this organ: and partly owing to this circumstance, as well as to the quantity of blood sent to it, compared with the rest of the body, and to the various causes tending at this age to derange its circulation, is readily kindled into an inflammatory state of its substance or membranes, giving rise to active congestions, effusions of fluid in the cavities and between the membranes, and to various other organic changes particularised in their appropriate articles.

8. *b*. With the susceptibility to be impressed by the causes of disease, evinced chiefly in the nervous centres and mucous surfaces, and producing their effects, not only on them but also on the serous cavities, there is intimately connected a marked disposition to be affected by medicines, which exert their influence in an especial manner upon the nervous system. Of these the most remarkable are narcotics and irritating stimulants. The susceptibility to the influence of the former, particularly the preparations of opium, and their effects, primarily in increasing vascular action in the brain, and secondarily in favouring congestion in the same organ, according to the dose, have appeared to me so important, that, during an extensive public practice amongst this class of subjects, I have scarcely ever ventured, during this epoch, on the exhibition of these medicines, excepting under peculiar circumstances, which will receive a more particular notice in other places. A similar caution is also necessary in the use of stimulating and irritating substances. The aperient medicines which are so often re-

perfect; and thus increased resistance is opposed to the extension of disease, and to its disorganising effects. All infectious and exanthematous disorders are very prevalent at this age; and, in addition to the maladies of the mucous surfaces already alluded to, the lymphatic glands, particularly those of the abdomen and thorax, are frequently the seat of disease; and worms often begin to form, particularly after the period of lactation. At this age also, owing to the changes in the infant's food, as well as to the irritation occasioned by dentition, the disorders which originate in depraved or imperfect digestion and assimilation are especially prevalent, particularly aphthæ, rickets, tubercules, marasmus, and tabes mesenterica, remittent fever, scrofula, and numerous cutaneous eruptions.

14. *c.* The *therapeutical* indications at this epoch chiefly relate to the care which is required to preserve the head cool, and ward off the vascular excitement to which it is liable. Anodynes are less injurious at this period than in that preceding it, and are often required, particularly in soothing the irritability of the nervous system arising either from difficult dentition, from the exhaustion occasioned by previous treatment, or by disease, and particularly in the advanced stages of whooping-cough and croup. The state of the gums requires particular attention; and where there is evidence of itching, this sensation requires to be allayed, first, in the way that nature points out, by pressing hard and smooth substances between the gums, as a coral, ivory ring, and what is best, a gold ring, when this may be directed. If the least appearance of local affection, as tumefaction, redness, &c., or even merely constitutional disturbance, manifest themselves, the gums should be freely and deeply scarified. Aperients, of a mild and cooling nature, are often required during this epoch; and in it, as well as in the preceding, blisters, even for a few hours only, particularly when the respiratory mucous surface is obstructed and its functions interrupted, or when the energies are exhausted and the vital resistance consequently reduced, must be employed with extreme caution, and give place to the use of those liniments which I shall have occasion to recommend as substitutes for them under such circumstances.

15. II. Period, or that of Childhood (*Pueritia*), extends from about the second to the seventh or eighth year, when the second dentition is completed. During this period the developement of the different textures and organs proceeds rapidly, and their functions are more and more perfect. The mental manifestations, particularly those which are intellectual, are developed, and the various moral emotions gain strength. The distinctions which exist between sexes throughout the whole physical and mental constitution at more advanced ages have not yet appeared. All the soft solids of the body evince increasing firmness, vital cohesion, and elasticity, and are protected by a firm covering of adipose matter below the integuments, and in the interstices between the muscles.

16. *a.* If the constitution be not vitiated by hereditary or acquired taint, defective nourishment, or previous ailment, or if the causes be not of a depressing nature, disease at this period assumes the sthenic character. Febrile diseases are generally acute; and, unless proceeding from sources of infection, usually the result of local inflammatory action, which evinces a marked disposition to terminate in the formative process, or effusion of coagulable lymph, particularly when the serous surfaces are implicated. The susceptibility to infectious diseases, particularly those with exanthematous symptoms, is very great; as well as to inflammations of the different textures and organs — to pneumonia, bronchitis, cerebritis, meningitis, gastritis, enteritis, &c.: besides these, glandular obstructions, chorea, verminous diseases, epilepsy, and the various forms of angina, are very prevalent at this age, particularly in those whose digestive organs have been neglected, and when morbid matters have been allowed to accumulate in the prima via.

17. *b.* The *therapeutical* indications applicable to this age present few peculiarities, besides the necessity of resorting to active depletions, with a cooling regimen and alvine evacuations in the majority of its diseases; and the keeping in recollection the tendency of mucous sordes and secretions to form and accumulate on the digestive mucous surface. Such accumulations furnish a nidus for the generation of worms, and sources of irritation to this surface itself, and to the nerves proceeding from it; and originate many of the affections which appear at this, and a subsequent period of existence. The necessity of enjoying, and the injurious consequences of the privation, of wholesome nourishment and active exercise in a pure atmosphere, and the advantages of sleeping alone in a large well-ventilated apartment, should not be overlooked, in their relation both to the production and to the removal of disorder. The employment of the faculties of the mind during this early stage of their developement should be left, until the last year or two of this period, more as a matter of amusement than of exertion; and, even then, greater attention should be paid to the developement of the physical powers, — the organisation upon which sound mental manifestations very intimately depend, — than to the precocious and even hurtful excitement of faculties which are merely budding into existence. The emotions of mind, however, particularly those which are connected with temper and disposition, ought first to receive attention; strict control cannot be prematurely applied in this direction. In this and the preceding epochs of life, it is indispensably requisite not to allow the child to sleep with persons in bad health, or who are far advanced in life.

18. III. Period, or Boyhood — Girlhood. From the seventh or eighth year to the epoch of commencing puberty, is chiefly characterised by the continued growth of all the structures, and the developement of the manifestations of mind. Towards the middle and end of this period the physical and mental distinctions of sex become more and more apparent. *a.* The frame, when free from disease or hereditary taint, evinces a sthenic diathesis, a predominance of the sanguine, or sanguineo-nervous temperament, and a liability to nearly the same diseases, particularly those proceeding from infection and inflammation, that prevail during childhood. There is a greater liability to be affected with idiopathic continued fever, with scrofulous enlargements and inflam-

mations, particularly of the lymphatic glands; with various nervous affections, as epilepsy, convulsions, chorea, &c.; with cutaneous eruptions; with inflammations of the throat and air-passages; with tubercles, especially in the lungs and alimentary canal; with flexures of the spinal column, and with verminous diseases. The nervous system possesses great susceptibility of impressions, moral and physical; and inflammatory action has a marked disposition to give rise to new formations, unless when appearing in the advanced stages, or as a sequela, of eruptive or infectious fevers, when it generally occasions serous or sero-albuminous effusions.

19. *b.* The diseases of this period generally require antiphlogistic remedies and evacuations, especially purgatives, either alone or in suitable combination, unless proceeding from depressing causes, particularly those of a specific kind; and even there the necessity of resorting to alvine evacuations, by means of laxatives, or purgatives combined with tonics, is imperative. The vital resistance is usually well marked, excepting in those who have been deprived of wholesome nourishment and pure air, or whose constitutions are radically in fault; and in these, whilst tonics and other means of restoration are required, the due evacuation of morbid secretions and accumulations is equally necessary. Care also should be taken during this, as well as in the preceding period, not to allow the young to sleep in the same bed with the old, nor even with those advanced in age or debilitated, nor with too many — not more than three — in the same sleeping apartment, which ought to be large and well aired. Want of attention to this, is one of the chief causes of disease in early life in London, and other large towns. Academies and boarding schools for both sexes are continually furnishing numerous proofs of this too generally overlooked cause of disease, not only at this, but also at a later stage of life. Attention is also necessary to the exercises of both the mind and the body. Active amusements in the open air are now particularly required. As this period advances, the mental powers acquire such a degree of developement as to admit of their further improvement and active exertion, — not only without risk to the organisation with which they are related, but with the certain prospect of advancing them nearer to the perfection to which our natures may attain.

20. During this and the earlier terms of life frequent changes of locality and of air, particularly from one healthy and open situation to another, and especially to one which is more salubrious, where this can be attained, are extremely beneficial, both in promoting the developement of the frame and in removing diseases, particularly those of a chronic kind, or which affect the digestive and assimilating organs. In many of these diseases I have often derived more advantage from change of air than from the use of medicine. But, during advanced convalescence from these and febrile diseases, the benefit derived from change of locality is most remarkable.

21. IV. PERIOD, or ADOLESCENCE, commences with the first appearance of puberty, and extends to the twentieth year of females, and the twenty-fourth of males. Puberty appears at various ages, according to the climate, the circumstances connected with education, and the constitution of the individual. The usual period in this country, is from the twelfth to the fourteenth year for females; and from the fourteenth to the sixteenth for males. In the northern parts of the island, it is often a year or two later in both sexes. It is often observed earlier in boarding-schools, both in respect of males and females. In the latter (in London or its vicinity), I have not infrequently met with instances of menstruation at ten and eleven years; especially in sanguine and plethoric constitutions; and where the apartments, particularly those for sleeping, have been crowded and close.

22. *a.* This is one of the most important epochs of human existence: for during it the natural developement of the sexual organs imparts a healthy and tonic excitement throughout the economy; bringing to their state of full perfection all the organs of the body and all the manifestations of mind, excepting those that are derived from experience. The organs of respiration and voice have acquired their full growth and tone, the muscles their due proportion, and the cerebro-spinal nervous system its beautiful organisation; placing man, by the exercise of its admirable functions, at the head of all animated creation, — the dread of all other animals, the wonder of himself. It is chiefly during this period of life that the mind becomes stored with ideas, derived both from the learning of the ancients, the science of the moderns, and the arts and accomplishments of highly civilised life; and is more particularly and more ardently engaged in decomposing the information thus acquired, and recombining it in new and useful and attractive forms.

23. As the functions and destinies of this period are important, so they require the supervision of the experienced and the good. For, with this developement and activity of both the physical and mental powers, the instinctive feelings and emotions of our nature have also reached the utmost limits of their activity; and many of them, particularly those which are related to the perfect condition of the reproductive organs, acquire an ascendency, that both the dictates of reason and moral restraint are required to control. Hence the propriety, both at this and the preceding period of life, of improving the moral affections of the mind; of inculcating sound principles of action and conduct, founded on moral and religious obligations; and of placing them in such relations to the feelings, the intellectual manifestions, and, moreover, to the accomplishments, the elegancies, and the endearments of life, as to render them attractive to a state of mind and constitution which is more easily allured by example than taught by precept.

24. The practices which both sexes are liable to acquire at this period of life, and to which they are more commonly addicted when they associate in numbers at seminaries and academies, demand the strictest supervision. They have been too generally overlooked, both morally and medically, from the circumstance of their consequences having been imperfectly appreciated. There is no practitioner of observation and experience, — certainly none of even limited knowledge, — who has travelled into foreign countries, and is yet

unacquainted with the physical exhaustion, the mental torpor, and all but annihilation of existence, which is the ultimate result of indulging them. From this source frequently spring, impotency hereafter; the extinction of families and hereditary honours — honours which such persons are incapable of achieving; the infliction, during after-life, of many of the diseases which proceed from debility, and the exhaustion of the nourishment and vital energy of the various structures and organs; of numerous nervous and convulsive maladies, as hysteria, epilepsy, neuralgia, chorea, melancholia, mania, idiotcy, &c.; the dangerous or fatal visitation of fevers; diseases of the heart, disorders of the digestive organs, premature baldness and old age, the formation of tubercles, and the production of pulmonary consumption; and, lastly, the transmission of weak and decrepid bodies and minds to the offspring; of scrofula, rickets, verminous complaints, marasmus, hydrocephalus, convulsions, tubercles, chorea, &c.: the curse is visited on the children to the third and fourth generation, until the perpetuated punishment extinguishes the very name of the aggressor.

25. *b.* The *pathological* conditions of this age are especially characterised by exalted action. At the approach and commencement of puberty, the glandular system is extremely prone to congestive inflammations, particularly the lymphatic glands of the neck and arm-pits. Tubercles are rapidly developed in the lungs; and this organ is much disposed to acute and chronic inflammations of both their substance and mucous surfaces. Pulmonary hæmorrhages usurp the place of the epistaxis of earlier epochs; and, in females, dysmenorrhæa, protracted or retained menstruation, chlorosis, hysteria, and occasionally menorrhagia or leucorrhœa, occur. The sanguine diathesis and plethoric habit, in those of a sound constitution, and the sanguine, irritable, and nervous temperaments, or the one associated with the other, most commonly prevail at this period of life.

26. The *progress* of disease is generally rapid, and its character acute. Inflammations are more prone to give rise to the formative processes; and febrile affections, when they terminate by crises, evince a preference to hæmorrhages and sweats. Idiopathic fevers, inflammations of the respiratory organs, and of the brain or its membranes, are the most common diseases of this age.

27. *c.* The *therapeutical* indications require but little remark; for the system has now nearly, or altogether, reached its full growth; and the general inferences which guide the practitioner in the employment of remedial means have now reference, especially, to states of habit, constitutional powers, temperament, and diathesis, — physical manifestations, which are now, in a great measure, developed, but which acquire their most predominant characters in adult age. As the maladies of this period are generally inflammatory, and evince a strong tendency to the formative process, and as the powers of life are now most energetic, vascular depletions, with the antiphlogistic regimen, are generally required, and are well borne; excepting in those whose constitutions have been originally in fault, or who have greatly injured it by the injurious practice of masturbation, from which so many suffer, both at this and subsequent epochs of life.

28. V. Period. Adult Age may be divided into the epochs, 1st, of *early adult age;* and 2d, of *mature age*, or *confirmed virility*. Of each of these I shall take a brief notice.

A. Early adult age may be dated from twenty to thirty in the female, and from twenty-four to thirty-five in the male. During this epoch, if the constitutional powers have not been injured previously, the whole frame and its individual organs continue to acquire strength; and, although the body has ceased to grow in height, it increases in bulk, particularly the muscles of voluntary motion and the parietes of the large cavities. It is also more capable of enduring continued exertion and privations; its vital endurance and resistance being greater than during the period of adolescence. The features and expression of the face; the character, disposition, temperament, and diathesis, are more unfolded, and towards the termination of this period fully display their manifestations.

29. *B. Mature age*, or confirmed virility, may be considered as being from thirty to forty, or forty-two, in the female, and from thirty-four to forty-eight in the male. During this time of life, the features of the countenance fully assume those modifications of character arising from the influence of the passions and emotions of the mind; and the appetites, habits, and occupations of life imprint upon the frame generally certain appearances, arising from their continued influence on the constitution. The muscular organs, particularly the muscles of the extremities, are prominently marked; the chest fully developed; the body spare and active; the adipose structure extremely scanty, and the abdomen small, in those habitually devoted to laborious employments, not of a sedentary nature, and to active exercise, either on foot or horseback. The sedentary, those addicted to the indulgence of the appetites, and particularly those given to the gratifications of the table, have large abdomens, small extremities, and large depositions of adipose matter beneath the integuments, between the muscles in the omentum and surrounding the viscera, with a weak and defective developement of the muscular parts. The studious present the chief marks of their occupations on the features of the countenance and character of the head; the appearance of the rest of the frame varying with the habits and indulgences with which study or the prosecution of science may be conjoined. At this period of life also the feelings, the anxieties, the disappointments, the losses, and the various moral emotions of life, begin to manifest those effects upon the frame, which become still more fully marked during the following epoch.

30. This and the preceding period of adult age are, upon the whole, the most exempt of all others from disease; but about the age of forty, and still more so as the age of fifty is approached, the sanguineous circulation becomes more and more languid, particularly in the veins: hence the frequency of venous congestions and visceral obstructions, with the various diseases depending thereupon, particularly hæmorrhoids; bilious derangements; bilious and gastric fevers; inflammations; affections of the heart; apoplexy and paralysis; derangements of the stomach and liver;

hæmatemesis; affections of the joints, as gout and rheumatism; diseases of the urinary organs; hysteria and uterine disorders; hypochondriasis, and affections of the mind. At this period therapeutical means require to be strictly regulated according to the sex, constitution, temperament, habits, and occupations of the affected.

31. VI. PERIOD. AGE, IN ITS SPECIFIC ACCEPTATION, may be divided into four epochs: viz. 1st, *Declining age;* 2d, *Green old age;* 3d, *Advanced old age;* 4th, *Decrepitude,* or second infancy. Before I proceed to consider these individually, I will take a view of the changes which supervene with age in the structures and functions of the body.

AGE, *in the specific acceptation of the word,* may be considered as commencing when the vital energies of the different organs begin to decline, — when the maturity of life glides into decay. The period at which this change supervenes varies very much in different persons, according to their constitutions, employments, and habits during the earlier epochs of existence. In many it is so gradual as to be imperceptible; in others it is more obvious; and in some it is induced rapidly and remarkably, by mental anxieties and bodily disease. The usual period of its advent, in both sexes, and the different epochs in which *age* may be divided, will be stated in the sequel.

32. As age steals on, all the functions are performed more languidly than in earlier life. The energies of the ganglial system decline, as evinced by the digestive, circulating, and secreting functions, which it actuates. The sensibility of the cerebro-spinal system, and of its dependent organs; the acuteness of our intellectual powers, our moral emotions and affections, and the activity and strength of the locomotive organs, — all experience diminution, great in proportion to the advances of age.

In noticing the pathological and therapeutical relations of age, those changes of structure and of function which supervene with it will *first* receive attention; *next,* the different terms into which it may be divided, with those modifications which diseased actions generally assume in each term respectively, and those indications which should guide our practice in the diseases to which each is most obnoxious, will be briefly considered.

33. *A.* The *modifications of structure* produced by age are occasionally slight; but most commonly they are very remarkable, particularly in certain organs. In some parts they are scarcely perceptible, in others more obvious, consisting chiefly of increase of density; and in many they amount to actual change of texture.

The *integuments,* particularly those of the face, and the *hair,* are amongst the earliest parts to exhibit the advance of age; and they most obviously indicate the different stages of its progress. The integuments of the face seem more developed than in early or mature age. They are denser and thicker, especially the cutis vera and rete mucosum; which latter assumes also a somewhat darker tint. The skin appears more loosely attached to the parts underneath it, chiefly owing to the diminution of the subjacent fat, and shrinking of the other soft solids. Hence it appears, particularly in the face, neck, and hands, flaccid and wrinkled.

34. The *hairs* of the head are, perhaps, the first to evince the commencement of age; and they present the most common indications of the progress of decay, either by a more or less complete change of colour, or a partial and general loss of them. The change of colour at first consists of a few white or grey hairs, scattered amongst those of a natural hue; but these gradually become more numerous, particularly on the temples, until the whole hair is altogether grey, and ultimately white and transparent. As this change proceeds, the hair also falls out, especially on the crown and forehead. There are, however, many circumstances which accelerate these phenomena, independently of age. Thus fevers, severe courses of mercury, masturbation, &c. will occasion the loss of the hair. But when it falls out from disease, the bulbous roots not being obliterated, its reproduction generally follows; whereas, when it is lost from old age or from masturbation, it is never reproduced. There are also various causes which occasion a change of its colour, particularly the depressing passions, intense application to study, anxieties of mind, venereal indulgences, &c., and which at the same time accelerate the loss of it. The change of colour, and subsequent loss of hair, seem to arise from deficient nutrition, and consequent atrophy, or destruction of the bulb, together with some change in the skin itself. In some cases it seems to arise from chronic disease of the rete mucosum and cuticle, as stated in the pathology of certain cutaneous affections.

35. The *adipose and cellular tissues* experience considerable change. The fatty deposit diminishes with the progress of age, and it sometimes becomes more fluid and watery, as well as of a deeper tint. The cellular tissue is somewhat denser, more fragile, and less elastic than in early life. In some situations it assumes a fibrous character, particularly that portion of it which invests the muscular fibres. The *serous membranes* are also more dense, more subject to ossific deposits, and their free surface drier than in early life. The *mucous surfaces* exhibit but little change, excepting as respects their greater paleness, and tendency to certain states of disease. The *fibrous structures* become more rigid, and in various parts the seat of ossific deposits. They also assume a deeper colour, and firmer and tougher consistence, whilst their physical cohesion is much increased as age advances.

36. The *muscles* of voluntary motion experience a very marked change, particularly at the advanced epochs of age. They are much diminished in bulk. Their fibres are more rigid, less readily influenced by stimuli, and less contractile than in early life. They are also less under the control of volition, much less energetic in their actions, more flaccid, and endowed with less vital tenacity. Their structure is also somewhat modified. They are paler, sometimes of a light yellow colour, and their fibres less distinct than in youth. The tendons and aponeurotic expansions of muscles, as well as the cellular tissue intervening, are often partially ossified. Portions of muscles, near their tendons, are sometimes converted into a tendinous structure; and the secretions poured into the sheaths of the tendons are remarkably diminished. From all these changes result the vacillating, embarrassed, and weak movements of the aged.

37. The *bones* acquire a dense structure, and even a somewhat increased size, particularly the bones of the head, the sutures of which become firmly united, first in the internal, and afterwards in the external surface. The *cartilages* are ossified, particularly those of the ribs. The intervertebral cartilages become hard, inelastic, and shrunk: hence the impaired flexibility of the spinal column, the bending forwards of the trunk, and diminished stature of aged persons.

38. The *blood-vessels* undergo very remarkable changes. The arteries are gradually diminished, in proportion to the bulk of the body, as age proceeds; and the predominance of the venous over the arterial system is more and more apparent. Whilst the arterial vessels become, on the one hand, more dense and rigid in their coats, their calibre diminished, their smaller ramifications altogether obliterated, and their *vasa vasorum* indistinct, the veins seem, on the other hand, somewhat thinner in their coats, more dilatable, and their calibre increased; they are also more tortuous, and hence their capacity is augmented: so that, although the quantity of blood contained in the body is diminished, particularly at the most advanced stages of life, about two thirds of it are contained in the veins. Besides those changes of capacity, the coats of the vessels present changes of structure. The arteries are liable to ossific and other deposits, rupture of their coats, &c.; the veins to varix, inflammation, &c.

39. The *brain and nerves* are also somewhat modified by age. The membranes of the former are generally slightly thickened and opaque. The bulk of the brain is diminished, and its substance firmer and tougher than natural, and less readily acted upon by chemical re-agents. The nerves seem to possess a diminished quantity of medullary substance, and their blood-vessels are indistinct. The *ganglia* become firmer, of a deeper colour, and smaller than in early life.

40. The *organs of sense* undergo important alterations. The eyes are changed chiefly by the diminished secretion of aqueous fluid into the anterior chamber, occasioning less prominence of the cornea, and a change of its refractive power. The crystalline lens acquires a yellowish tint, and is less transparent. The nerves of the eye, particularly the optic nerves and ophthalmic branch of the fifth pair, and the iris, are less sensible than before; and hence the dilatation of the pupil, the distant sight, and the confused appearance of near objects to aged persons. The ear experiences a change similar to that which takes place in the eye. The fluid occupying its internal cavities is diminished or altogether absorbed; and the auditory nerve rendered insensible to impressions, from this and other changes in the conditions necessary to its functions. The other organs of sense, particularly taste and smell, have also their sensibility similarly blunted.

41. But changes are not limited to the more elementary structures of the body; and organs of sense, the *viscera* of digestion, secretion, assimilation, sanguifaction, and generation undergo analogous alterations. The teeth loosen or decay; the gums are partially absorbed; and the jaws, deprived of teeth and of their alveolæ, approximate more closely. Hence the projection of the chin, its approach to the nose, and diminished capacity of the mouth. To these causes are partly to be imputed the change which takes place in the speech of the aged. The *stomach* and *bowels* are generally flaccid, owing to deficient contractility of their muscular coats; but the *liver, pancreas,* and *spleen* present but little change, excepting they are, or have been, the seat of disease, unless slight atrophy, or enlargement and increased density. The *urinary organs* are more frequently altered: calculi are not infrequently met with in the tubuli uriniferi and pelvis of the kidneys; and the urinary bladder is generally thicker and firmer in its coats than in early life; the prostate gland is commonly somewhat enlarged.

42. The *lungs* are not necessarily changed by age, further than that they become less elastic, their air-cells enlarged, some of the bronchial ramifications more dilated, and portions of them emphysematous. They frequently, however, present the remains of antecedent disease. The *heart* partakes, although in a less remarkable manner, of the changes experienced by muscular parts. The tone and energy of its fibres are lowered; its structure is softer, more flaccid, and occasionally also paler. It is sometimes diminished in size; or some of its cavities are dilated, and their parietes thinned; and cartilaginous or ossific formations, or both, occur in parts of its internal surface, particularly in the valves.

43. The *organs of generation* experience a marked alteration. The *ovaria* shrink, become dense, and their vesicular structure changed. The *uterus* is diminished in bulk, unless it is the seat of organic disease, to which it is very liable, particularly at its mouth and neck. The *mammæ* also waste, are soft, pendulous, and lastly are entirely absorbed. The areolæ become dark, and the nipples shrink. At the commencement of age they are subject to congestions, indurations, and scirrhous disease. The *testes* shrink, or become soft and small, or even nearly disappear. The *penis* is shrunk, seldom experiences the vital turgescence, and lastly not at all; the faculty of generation having previously disappeared.

44. In this rapid sketch of the chief changes which the structures and organs of the body undergo from age, there are several phenomena which must strike the reader. The chief of these are, the gradually increased density of the different textures, and the consequent diminution of their watery or fluid constituents, as well as of the blood itself. In childhood and early life the textures are succulent, and the circulating fluid abundant. But as age advances, they acquire an increase of their physical cohesion, whilst their vital attraction is diminished. This increase of density and diminution of the fluid elements of the structures, with the progress of age, are constantly observed in the vegetable kingdom of nature: and, as we advance upwards, through the various grades and classes of animals, we find this principle strictly adhered to. In addition to this, another phenomenon is remarkable; namely, the redundance of osseous matter, as evinced not only by the increased quantity of earthy matter in the bones and cartilages, but also by the deposition of this substance in the coats of the arteries and in other textures. Somewhat analogous to these formations, and sometimes even vicarious of them, is the abundance of sabulous deposits from the urine, frequently observed to occur either during

the secretion and retention of this fluid, or after its discharge.

45. Not only are the mechanical conditions of the different parts of the body modified by age, as now stated, but their chemical properties are also similarly affected. The gelatin disappears, or becomes changed to albumen; the fibrin is increased, and assumes a deeper hue, and is less easily affected by maceration or exposure to the air. The phosphate of lime is augmented, and often accumulates to a very hurtful extent, together with the other earthy salts and urea.

46. *B. Of the conditions of function characterising the advance of age. a.* Although the changes, which have been now described as supervening in the different structures with age, may have originated in those imperceptible and slow modifications which the various organic functions experience from peculiarities of constitution, of food and employment, or from acquired habits and indulgences; yet there can be no doubt that, when once induced, they modify still further these functions, and thus draw on other lesions, and ultimately still greater alterations of both function and structure, or even speedily fatal disease. But we are not altogether justified in considering these contingencies as the primary causes of the changes now described. We are rather to view them as more or less remote effects of the failure of the vital endowment of the frame, manifesting itself first in a less perfect performance of the different functions, and subsequently in modifications of structure, and ultimately in very obvious lesions of both function and structure.

47. *b.* It is supposed by some, that the embryo at its earliest formation is endowed with a certain sum or allotment of vitality, which, in the earlier epochs of life, is engaged in the formation of, and in bringing to perfection, the different structures and organs of the frame; that it is gradually exhausting itself ever after, until it at last expires; and that the greater the excitement of its different manifestations and functions during the subsequent stages of existence, the more rapidly will its termination be reached; that the oil with which the lamp of human, and indeed all animal, existence burns is filled at its commencement, and is never afterwards supplied; and that the more brilliant the flame, the shorter will be its duration. This captivating hypothesis, however, appears, on an intimate view, irreconcilable with many of the phenomena of health and disease. It cannot readily be conceded that the allotment of vitality bestowed upon the germ or germs can exceed that possessed by the parents, — for the hypothesis is, that the sum of vitality is greater the younger the animal; and that it diminishes with the advance of days and years, from the period of its endowing the embryo. But it is obvious, that the greater vital endowment cannot issue from the smaller; that the parents cannot possibly impart to the embryo more than they possess, they still retaining a portion afterwards: more particularly when we consider that the greater endowment is imparted not to one embryo only, but to several, as is the case in the lower animals, and often in the human species also.

48. The phenomena, moreover, of disease furnish us with proofs that this sum of vital endowment is neither thus early and at once bestowed, nor thus uniformly diminished, according to the waste it experiences, without occasional reinforcement. We frequently perceive all the manifestations of life reduced, at different epochs of existence, nearly to total extinction, particularly in several kinds of fever, when, having received the requisite aid from external stimuli, they have been gradually restored to their former activity. Indeed, the various circumstances in which the body is placed, and the different states it presents at different periods of life, and from numerous causes which affect it, seem rather to favour the idea that the sum of vitality, and its manifestations in the different organs, fluctuate more or less during the allotted period of existence; that a certain emanation of vitality proceeds from the parents, great in proportion to their constitutional powers; but that this endowment is constantly experiencing an accession, first from the mother, and subsequently from the common sources of air and aliment; that this reinforcement is thus constantly supplying the waste arising from the exercise of the various functions, and adding to the bulk of the structures, until manhood is reached; and that at this period the sum of vitality has reached its greatest amount, from which it gradually declines, owing rather to the waste, particularly that occasioned by the exercise of the generative functions, exceeding the supply, than from the continued expenditure of what is at first bestowed and never afterwards reinforced.

49. Having been induced by the foregoing, and other considerations, to relinquish the former for the latter hypothesis, I infer that the gradual diminution of the vital energies that accompanies the progress of age is more or less manifested throughout all the functions; that the functions first evince this decline, and that the organs themselves are at last modified in organisation, from the slightest and almost inappreciable shades to the most marked alterations. The changes of structure, once induced, tend most essentially to heighten and to perpetuate the previously slight disorders of function, until both the one and the other undergo, by reciprocity of influence, most important alterations, terminating at last in death, and the dissolution of the frame. I now proceed briefly to notice those changes of function, which, frequently related to the alterations of structure described above, mark the existence of Age.

50. *c.* I have, in another place, stated that, of all the different tissues of the frame, the ganglial system is the most intimately related, in every way, to the vital influence which endows the body. And it is precisely those organs which are most immediately connected with this system that first furnish proofs of incipient decline in the languor or imperfections of their functions. Amongst those functions are comprised those of digestion, secretion, circulation, assimilation, the preservation of the animal temperature, and generation. The functions of animal relation are not so soon affected; and at first the change in them is rather secondary, and owing to the pre-existing change of the functions of organic life, — of those functions which are excited or actuated through the medium of the ganglial system.

51. As very intimately dependent upon the state of the ganglial system, the *secretions* manifest, with the advance of age, the most remarkable

lesion. These are generally modified in *quantity*, in *fluidity*, and in *quality*. 1st, The quantity of the secretions, both recrementitial and excrementitial, is sensibly lessened. The salivary, gastric, biliary, cutaneous, and spermatic secretions evince this change. 2d, Their fluidity is diminished, as shown by the salivary, the lachrymal, cutaneous, and watery exhalations and secretions. And, 3d, their properties are modified, as proved by their marked tendency to assume, immediately as they are secreted, irritating and acrimonious qualities, as shown by their effects upon the tissues, with which they remain for any time in contact, and to pass rapidly into decomposition. The urine, and occasionally the lachrymal, the mucous, the biliary, cutaneous, and sebaceous secretions evince this change. It very generally happens that the secreted fluids experience more than one of the above alterations; they being diminished both in quantity and in fluidity, and at the same time deteriorated in quality. This is remarkably the case in respect of the cutaneous, mucous, and urinary secretions; the chief exception being furnished by the mucous fluid, which is sometimes increased, although it is of diminished fluidity and altered quality: but this is rather an effect of disease, than merely of advanced age.

52. Next to the function of secretion, and owing to the same cause, — the diminution of vital influence, — that of circulation is most sensibly affected. The action of the heart is slower than in early life, much less energetic, and occasionally irregular. The capillary circulation is more languid, and a much smaller quantity of blood penetrates the extreme ramifications and nutritious vessels, in consequence, most probably, of the diminished calibre of those vessels, and the increased density of the tissues in which they terminate. The venous circulation is more congested, and more prone to experience the consequences of engorgements, particularly varicose dilatations, giving rise to effusions of blood and other serious diseases. The blood itself is not only diminished in quantity, but is also of a darker colour, and is probably also slightly changed in quality, particularly in respect of certain of its saline constituents. The absorbent system is less frequently disturbed in its functions by age than almost any other part of the frame, although it occasionally evinces diminished power, but chiefly in connection with disease. To the predominance of the absorbent function over that of arterial circulation has been partly ascribed, and with apparent justice, the wasting and condensation of the structures characterising the most advanced epochs of life.

53. As intimately connected with the weakened energy of the ganglionic and vascular systems, the functions of digestion and assimilation are languidly performed. The gastric, pancreatic, and biliary juices are less abundantly secreted in the aged than in those of early or mature years; and the tonic contractility of the coats of the stomach and bowels is diminished. Hence result various dyspeptic ailments, flatulence, and a sluggish state of the bowels. The receptacles which nature has provided for the temporary retention of the secretions and excretions, particularly the biliary and urinary bladders, react imperfectly on their contents, owing to the lowered power of the nerves which actuate them: hence arise distension from the inordinate accumulation of the secretions poured into them, and changes of the properties of these secretions during their retention, either occasioning their expulsion, or producing actual disease.

54. As closely related, also, to the lowered energy of the nerves of organic life, and consequent languor of the circulation, the generation of animal heat in the aged is evidently diminished, although the causes which usually moderate it in the young,—namely, abundant exhalation and evaporation from the surfaces of the lungs and skin, —exist in a much less degree in the former. The functions of generation are, however, those most remarkably affected. In the female the faculty of conception is altogether abolished, and important changes occur in the state of her appropriate organs; yet the sexual desire still lingers for a while: and in the male, although the ability of procreation may remain, under favourable circumstances, for some time, it is at last entirely abolished.

55. Thus we perceive, that as the different viscera of organic life increase in density, and experience a diminution of vital expansibility and contractility, so their functions become more languid or imperfect, until some of them cease to be performed, and others are remarkably altered. But the change is not limited to this class of structures. Those organs which are devoted to the extension of our intercourse with surrounding nature, and are subservient to the manifestations of mind, as well as those manifestations themselves, in both their intellectual and moral relations, undergo, although at a more advanced period, in respect of some of them, very marked modifications.

56. The changes that take place in the muscular and their associated structures evidently would render them incapable of performing those actions, to which volition may impel them, with energy, rapidity, and steadiness, even although the nervous system of voluntary motion were altogether unaffected. But this system, owing probably to those slight, and nearly unappreciable, alterations noticed above (§ 36.), possesses much less energy and susceptibility of action than in the prime of life, and therefore actuates the muscles in a less vigorous manner.

57. The same condition of the brain and cerebro-spinal nerves, which contributes to render the actions of volition less precise and energetic, seems also to be connected with the less vigorous exercise of the intellectual powers, and the imperfect conditions of the functions of sense. These functions generally indicate incipient decay before the powers of mind are affected; and some of them are nearly abolished, particularly hearing and seeing, before the latter evince any marked change. But more commonly the decay of the senses is soon followed, occasionally as a necessary result, by a slight failure of some of the mental faculties. The memory, and the power of association as intimately related to memory, are the first to evince this declension, generally by a want of recollection of the names of persons, subsequently of the names of things and of recent events, or recently detailed information; the judgment continuing either altogether or but slightly impaired. With this declining state of the faculties, the emotions of the mind are often remarkably blunted; the desires and affections are

impaired, excepting in as far as respect early-formed associations and affections, which are often recalled with acute and even overwhelming emotion.

58. As age advances sleep is much lessened; and not only is the duration of repose abridged, but also its soundness; the rest of the aged being imperfect, and disturbed by dreams. It is difficult to explain this — indeed no satisfactory explanation of it has yet been offered; but it is generally observed, particularly in very advanced age.

59. Such are the changes induced by age in the various structures and functions of the body, as evidently caused by the gradual decline of the vital energy, from the period of full manhood to its ultimate extinction. I have described them as much divested as possible of the effects of disease. As now noticed, those changes gradually lapse into death, — the lamp of life having burnt out, its oil having been exhausted, after a gradual diminution of the supply, without any single organ evincing that state of disease to which the cessation of life can be ascribed. This is, however, not a common occurrence; for, during the gradual decay that marks the progress of age, some organ or other, owing to the deleterious influence of surrounding agents, or of mental emotions, and the weak resistance of the vital influence, experiences a more or less marked derangement, which increases to actual disease, and either abridges the remaining short period of existence, or renders it less supportable.

I now proceed to notice the different epochs of advanced age, with reference chiefly to the diseases incidental to each, and to the therapeutical considerations which should influence the treatment of them. (See Climacteric Disease.)

60. 1st *Epoch, or declining age* extends from forty or forty-two to fifty-two in the female, and from forty-eight to sixty in the male. *a.* During this period the appetites, occupations, and habits express themselves still more strongly upon the outward appearance of the frame than in that immediately preceding it; and the feelings, emotions, disappointments, and anxieties of life manifest more fully their effects upon the internal organs, as well as upon the external aspect. Venous congestions, visceral obstructions and engorgements, with all the specific forms of disease already enumerated, (§30.) are more frequent than during earlier epochs, particularly apoplexy and paralysis, hæmorrhoids, hepatic disorder, dropsies, structural change in the kidneys and bladder, hypochondriasis, hæmatemesis, gout, and chronic affections of the respiratory organs.

61. *b.* In this period, the second great change to which the constitution of the female is liable generally occurs, terminating that epoch in which her sexual constitution is especially marked; and with this change frequently commence, or are matured, several diseases of the female organs. Morbid changes of the uterus and its appendages, as well as of the breast, are now very frequent; and sometimes they assume a malignant character. Various maladies, to which the female was less exposed than the male, are now oftener met with; and her constitution, with its disposition to disease, approaches more nearly to that of the male than during the time of marked uterine activity.

62. 2d *Epoch*, or *green old age*, may be reckoned to commence about 53, and to extend to 60 or 65 for the female; and to begin about 60, and extend to 65 or 70, in the male. During this epoch the nervous, circulating, and muscular energies begin to languish, with the vital actions of the different internal organs. The functions of the sexual organs gradually disappear. The female no longer conceives; and sexual plethora ceases to supervene and to relieve itself by a periodical discharge. The ovaria begin now to be gradually diminished in bulk, and to assume a firmer structure; the appetite for procreation slowly disappearing (§ 43. 54.). The male organs also either become less disposed to their proper functions, or nearly altogether lose the faculty of performing them, particularly when the energies of the constitution have been exhausted by previous indulgences carried to an excessive length, or by mental exertions. The teeth decay, and the digestive functions suffer from the imperfect mastication of the food (§ 41.).

63. 3d *Epoch*, or *ripe old age*, dates from the preceding, and extends to 70 or 75 in the female, and to 75 or 80 in the male. During this term the sensiferous and sanguiferous systems languish more and more, and all the vital organs experience a rapid decline of activity. The teeth fall out, the gums are partially absorbed, and the digestive functions are greatly impaired. The sexual organs are nearly or altogether deprived of their functions; the digestive and assimilating viscera experience a marked diminution of power; and senile marasmus, or the leanness of old age, advances (§ 53.).

64. *a.* The diseases of this and the preceding epochs are chiefly weak or imperfect digestion and assimilation; chronic inflammations; general asthenia and cachexia; apoplexies; paralysis; loss of the senses of sight and hearing; senile gangrene; comatose affections; dyspnœa; diseases of the heart and liver; dropsies; organic changes in the urinary and sexual organs of both sexes; passive hæmorrhages, from the stomach, bowels, and urinary organs; mental disorder; and gradual extinction of the vital functions and energies. Febrile and inflammatory diseases have a much more marked disposition to terminate in organic change, owing to the diminution of vital resistance, than during the preceding epochs of life.

65. *b.* The *therapeutical* indications of this period are in some respects important, but chiefly with reference to the necessity of supporting the powers of life during the diseases to which it is liable. When inflammatory or febrile disorder is present, and depletions or evacuations are necessary, we should, particularly if we employ them actively, watch their effects, and resort to the use of means calculated to support the frame as soon as indications of exhaustion are manifested. Purgatives at this period should, if frequently repeated, always be combined with warm, tonic, or supporting medicines, or with a restorative regimen; and a strict reference ought to be made to the habits, constitutional powers, and feelings of the patient, in all the remedies we prescribe. Old habits must not be suddenly relinquished or opposed, and the powers of life should be carefully watched; for, if unheedingly reduced, they will, particularly in large cities, often sink most rapidly, without the power of rallying. When we

consider that, in persons advanced to this age, a considerable portion of the arterial system is often in a state of slow organic disease; that the venous system is prone to congestion, is sometimes relaxed and almost varicose, always deficient in vital contractility, and scarcely able to perform its functions; and that both the one and the other cannot thereby so readily accommodate themselves to sudden or copious losses of blood as in early life and when they are perfectly free from disease, we cannot be surprised at the sudden depression occasioned by vascular depletion, or other means which produce a rapid discharge by the emunctories of the watery parts of the blood, or a sudden depression of the nervous energy, even although symptoms seemed unequivocally to demand their employment.

66. The last *epoch*, or that of DECREPITUDE, or *second infancy*, commences at 70 or 75 in the female, and at 75 or 80 in the male, and terminates the life of those whose span of existence is thus far prolonged. During this period, all the physical and mental powers rapidly decline. The body emaciates, the muscles waste, and the adipose structure is absorbed; the integuments becoming lax, wrinkled, dry, and disposed to retain accumulations of sordes. The knees totter and bend under the weight of the body; the trunk stoops, and is incapable of any considerable motion, excepting forwards; and the features are wan, devoid of colour, wrinkled, and emaciated, and apparently consisting chiefly of integumental covering (§ 33.).

67. *a*. Congestions, enlargements, obstructions, and even atrophy of the internal viscera; effusions of fluid into the shut cavities; irregularity of the heart's action from loss of its vital activity, or structural change of its valves, its arteries, or muscular texture, or from disproportion between the capacities of its compartments; lesions of the vascular system generally, in which either those of the arteries or of the veins predominate. Passive hæmorrhages from the mucous surfaces, particularly those of the alimentary canal and urinary apparatus; general asthenia, or cachexia; and slow extinction of the vital and natural functions of the frame, — the ganglial, the cerebro-spinal, and the circulating systems; and the digestive, the respiratory, the secreting, and excreting organs, evincing individually, or either of them conjointly with others, more or less disease, — are the principal causes of death: and thus man, whose mental and physical constitution and organisation were objects of profound study and admiration to himself, passes away; the vital essence, that actuated the wisely devised frame with which it was so surprisingly associated, returning to the Divine source whence it emanated; and the gross materials, which it combined and preserved in wonderful states of association, assuming novel modes of existence, and serving to form new beings much lower in the scale of organised creation.

68. *b*. The rapidity with which acute disease generally runs its course at this period, and the celerity with which organic change will frequently supervene and extinguish the dimly burning taper of life, require great decision and circumspection on the part of the physician. The resistance which the energies of life usually oppose, both to the extension of disease to other viscera from that first attacked, and to its disorganising effects in its primary seat, is now so excessively weakened, that remedies, directed with a due regard to the previous habits of the patient, in support of those energies are particularly necessary. On the choice of cordial remedies, and on their appropriate application to the circumstances of individual cases, will depend their success, and the reputation of the physician. At this period, depletions and all evacuations, excepting such as are requisite to carry off accumulations of morbid matters from the *primæ viæ*, and which impart, along with their evacuating operation, a restorative and cordial influence, must be abstained from; and care should be taken that fainting, or even nervous depression, may not supervene from their action. Warmth, at this and the preceding terms of advanced age, is indispensably required, both in the clothing and apartments; but it should be equable, and not too high. The lungs of very aged persons should be guarded from the ingress of very cold air, as the impression of cold in this organ paralyses its functions, arrests those changes which the blood undergoes during respiration, and induces apoplectic or comatose seizures, and idiopathic syncope or inaction of the heart. For these reasons, also, atmospherical vicissitudes should be assiduously avoided, as far as the means of doing so are placed within our reach. There is scarcely any measure more influential in supporting the sinking vital energies of age as the communication of animal warmth, particularly from the young of our own species. This was well known to the ancients, and is one of the oldest restorative means of treatment practised, having been adopted by David. The aged ought also to avoid the use of very cold fluids, as being apt to depress the energy of the stomach below the power of healthy re-action. Medicines, also, particularly purgatives of a cold nature, as the neutral salts, if exhibited at all, require to be combined with warm aromatics or stimulants, in order to counteract their depressing influence upon the alimentary canal, and on the nerves of organic life.

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AGEUSTIA. See TASTE, *Defect or Loss of.*
AGRYPNIA. See SLEEPLESSNESS.
AGUE. See FEVER — INTERMITTÈNT FEVERS.

AIR. See Disease, *its Causation, Removal, &c.*

ALOPECIA. See Hair, *the Loss of.*

ALUSIA. See Illusion.

AMAUROSIS, from ἀμαυρός, obscure. Syn. *Gutta Serena, Suffusio Nigra,* Celsus, Lucretius, Pliny. *Obscuritas, Hebetudo,* Paulus Ægin. *Paropsis Amaurosis,* Good. *Cataracta Nigra,* Auct. Germ. quibusd. *L'Amaurose,* Fr. *Die Schwarze Staar,* Germ. *Gotta Serena,* Ital. *Stekelindheit,* Hol. *Suffusion, Drop Serene,* Milton. *Dimness of Sight, Blindness.*

Classif. 4. *Class,* Local Diseases; 1. *Order,* Impaired Sensations (*Cullen*). 4. *Class,* Diseases of the Nervous Function; 2. *Order,* Affecting the Sensations (*Good*). *Functional Amaurosis,* I. Class, IV. Order. *Organic Amaurosis,* IV. Class, III. Order (*Author,* see *the Preface*).

1. Defin. *Partial or total blindness, from affection of the retina, or of the nerves, or of that part of the brain related to the organ of sight, whether arising primarily from functional disorder, congestion, inflammation, or any other change of these parts; or occurring from sympathy with other organs.* Or, in other words, *Partial or total loss of sight, from other causes than those which obstruct the passage of the rays of light to the bottom of the eye.*

2. Amaurosis is met with at all ages; but most frequently in the more advanced terms of life. It is sometimes congenital; and in these cases it is often difficult to ascertain the nature and seat of the affection. When it occurs at advanced periods of life, an attentive enquiry into the history of the disease, of the previous habits and ailments of the patient, and of the various resulting and related morbid phenomena, will generally throw light upon its pathology.

3. I. Seat of Amaurosis. — 1st, *In the retinæ.* Viewing the delicate structure of the retina; its relation to the optic nerve, of which it is an expansion of great tenuity; its connection with the choroid and hyaloid membrane, and its nervous and vascular communications; and considering the various morbid states it is liable to undergo, in consequence of its relations with these and other parts; a partial, and even total, abolition of ts functions is to be looked for on some occasions. It is, like all other parts of the frame, liable to congestion and inflammation, with their usual results; and, like other nervous parts, its functions are subject to a partial or complete extinction without itself evincing any change of structure, its sensibility alone being impaired or abolished; owing either to some unappreciable change, or to some one or more of those alterations in its adjoining or related parts about to be noticed.

4. 2d, *In the optic nerves.* These nerves may be more or less changed in some part of their course, from the anterior pair of the corpora quadrigemina, along the thalami, the tubera cinerea, and their partial decussation, until they terminate in the formation of the retinæ. In appreciating, however, lesions in the course of the optic nerves, the results of experiments on them should be taken into consideration: — if an optic nerve be divided previous to this decussation, sight is altogether lost on the opposite side; but if the division be made between the decussation and the eye, vision is lost on the same side.

5. 3d, *In the ganglial nerves.* There is every reason to suppose that the retina is in intimate communication with other nerves, and that it mutually influences and is influenced by them. Branches of the great sympathetic may be traced upwards, from the first cervical ganglion, to the ganglion lodged in the cavernous sinus; whence branches proceed and communicate with the third, the first division of the fifth, and sixth pairs of nerves. Branches also pass from the cavernous ganglion directly to the lenticular ganglion. As the internal carotid artery passes into the cranium, it is surrounded by the sympathetic nerves, which accompany all its ramifications. The ophthalmic artery is invested with these nerves; its branches to the choroid, iris, and retina being similarly provided. Branches of nerves, moreover, proceed from the lenticular ganglion, as M. Ribes* and others have demonstrated, to the iris, giving more minute branches in their course to the retina. This connection being established, morbid states of these nerves and ganglia, or changes of structure in their vicinity affecting their functions, must necessarily impair the sense of sight.

6. 4th, *Other nerves,* as the fifth and third pair, are, in some cases, also the seat of amaurosis. It has been shown by Magendie and Desmoulins that the integrity of the fifth pair is necessary to the perfect function of the retina; and Mr. Mayo has furnished evidence that the third pair is requisite to the motions of the pupil. If the great sympathetic be divided in the upper part of the neck, the pupil becomes contracted and immoveable, and the eye wastes.

7. 5th, *Parts of the encephalon* connected with the optic nerves in their course are occasionally the seat of amaurosis, as pathological research and experiment have shown. MM. Magendie and Serres have proved that, when these parts are wounded, the sight of the opposite eye becomes either weak or extinct.

8. 6th, The *pineal* and *pituitary* glands are frequently the only parts in which any alteration can be detected in the examination of amaurotic subjects. The connection of these glands with the ganglial system is stated at another place. Besides these, other parts of the brain, when the seat of organic disease, are not infrequently the principal source of amaurosis, as shown hereafter.

9. II. Causes. — 1st, The *predisposing causes* of amaurosis are very diversified. Amongst these, the influence of hereditary disposition is well established. Beer traced it in several families; in one of them through three successive generations, and particularly in the females of that family who had not borne children, it having appeared in them at the cessation of the menses. Beer also states, that dark eyes are much more liable to it than the light; the proportion being upwards of twenty to one.

10. Whatever tends to favour sanguineous congestion of, or serous effusion in, the encephalon, particularly insolation; forced exertions of the mind or body; excesses of passion; the pregnant and puerperal states; occupations requiring frequent stooping; errors of diet, and neglected ailments affecting the stomach and liver; the abuse of wine or spirituous liquors; suppressed discharges, particularly those from the nose and ears; interruption, or entire cessation, of the

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* Mém. de la Soc. Méd. d'Emulation, t. vii. p. 99.

menses; the gouty, rheumatic, and strumous diathesis; the retrocession or suppression of eruptive diseases; and habitual constipation;—whatever exhausts the vital energy of the brain, and nerves supplying the organ, as chronic diarrhœa, typhoid fevers, the excessive use of snuff, long-continued grief, prolonged suckling, neglected fluor albus, excessive venery, and manustrupation; —and lastly, whatever exhausts slowly the sensibility of the organs of sight themselves; as the incautious use of the eyes in a glaring light or on minute objects, and the existence of strumous ophthalmia in childhood, generally *predispose* to amaurosis.

11. 2d, The *exciting causes* are very numerous; indeed, any of the causes enumerated as merely predisposing to the affection may excite it, when acting long or intensely, although the successive or combined action of various causes are generally required. Amongst the most common exciting causes, are over-exertion of the sight; exposure to very bright light; its occupation on minute objects, or employment in candle or lamp light, and during the hours usually devoted to sleep. The sensibility of the retina may be destroyed, even by a single exposure to these causes. Lightning is another cause, which seems to act by extinguishing the sensibility of this very delicate part. In general, however, it is the long-continued over-excitement of the organs of sight that occasions the gradual abolition of their functions. Injuries on the eye, and in its vicinity, are also frequent causes of the disease.

12. Poisonous substances occasionally produce an attack of amaurosis; sometimes suddenly, at other times slowly. Belladonna, stramonium, solanum dulcamara, &c., fish-poison, various fungi, and animal poisons, occasionally have the former effect; but it is most frequently only of temporary duration; whilst other narcotics taken habitually, as opium and tobacco, produce the latter effect, and in a more permanent manner. The poison of lead, blows on the head, child-labour, and puerperal convulsion, frequent attacks of epileptic or other convulsions, cerebral apoplexies and paralysis, injuries of the branches of the fifth pair of nerves (three cases of which have come before me), and even irritation of these nerves, will produce this affection; it has also been observed to supervene to gastric and intestinal irritation, particularly when occasioned by worms; to hypochondriasis, and accumulations of bile in the liver, &c.; to frights, and to the irritation proceeding from carious teeth. The sudden suppression of epistaxis, of hæmorrhoids of the lochia, of the milk in nurses, of the menses, or of the perspiration; the repulsion of eruptions on the head and behind the ears, and the drying up of old ulcers, have, severally, occasioned the disease. But most frequently it is the result of two or more of these causes, acting under circumstances of predisposition. Females with dark eyes are extremely liable to the disease, upon the cessation of the menses; and, like deafness, it is apt to appear after severe attacks of typhoid and scarlet fevers. Amongst the more rare exciting causes of this affection, are the gouty and rheumatic diathesis, or misplaced and retrocedent gout and rheumatism; the constitutional effects of syphilis, and hurtful influence of mercurial courses; — all which have been assigned as causes of the disease by some authors, and denied by others; but, undoubtedly, producing it on some occasions, although not so frequently as the former believe.

13. 3d, The *proximate* or *efficient causes* of this affection are various. It has been disputed whether or not it can arise from altered function only, and without change of structure. Mr. TRAVERS believes that it does, but Mr. MACKENZIE denies it can depend upon morbid function merely; and other writers take opposite sides of the question. There can, however, be no doubt, if we attentively consider the disease in relation to the exciting causes and the effects which are observed to result from them, that, although most commonly the consequence of some appreciable change in some one or more of those parts instanced as its seat (§ 3—6.), it is occasionally unattended with such change, — at least to such an extent as our observation of the effects proceeding from similar alterations would lead us to expect. It should not be overlooked that the operation of many of the causes which have been adduced above is entirely vital — upon the functions of life, as manifested in the organ, or in remote parts of the frame; — that their effects are sometimes almost instant, and before organic change could have been produced; and that the disappearance of their effects has been sometimes as sudden, and often before the restoration of morbid structure, providing that it existed, could have been brought about. I believe, after a careful perusal of the works which have been furnished by surgeons on this disease, that a too marked disposition has been evinced to consider it as a result of organic change in the organ and the nerves, and vessels connected with it, and without relation to constitutional and vital causes.

14. When describing the *seat* of amaurosis, the influence of organic changes has been briefly noticed; and a fuller reference to them will be made in the sequel. Amongst the numerous lesions of structure that occur in the brain and its membranes, there are many that affect the nerves of sight, more particularly the optic nerves, or which implicate them organically in some part of their course in a very remarkable manner. Alterations in the bones of the cranium, as well in the membranes, obstructing the functions either of these nerves or of the other nerves subservient to the perfect exercise of this important sense, are also not uncommon.

15. The EFFICIENT CAUSES of this affection, therefore, are, 1st, *vital or functional*, depending upon imperfect or abolished sensibility of the retina, or of the optic and other nerves subservient to vision, owing either to causes which, from their direct and local action, depress or exhaust this property, or to those which, from their primary influence upon the frame, have an indirect depressing effect, which is not limited to this organ, although manifested in it in a more marked degree, owing to various concurrent circumstances. This constitutes the *functional form* of amaurosis admitted by BEER, WARDROP, TRAVERS, SANSON, and others, and which BEER divides into two subordinate kinds: *first*, that which proceeds from direct depression of the vital sensibility of the eye; and, *second*, that which is owing to inordinate excitement, and consequent exhaustion of this property.

16. 2d, *A congestive or inflammatory state of the vessels of the retina, or parts immediately adjoining, or the usual effects of these states.* PORTAL, PLOUCQUET, PROCHASKA, ROUSSEAU, SANSON, MAGENDIE, and other pathologists, have observed varicose states of these vessels; unusual injection of the minute arteries of the adjoining coats, and of the retina itself; a complete *retinitis;* exudations of lymph under the choroid, near the ciliary circle; inflammation of the external surface of the sclerotic; vascular injection, and firm adhesion of the retina to the choroid; partial detachment of the retina from this coat; and thickening, morbid density, and change of colour of the retina. Ossification; fibrous degeneration, with partial thickening; wasting, and malignant disease of the retina, and even the developement of transparent vesicles in it, have all been noticed by HALLER, MORGAGNI, HEISTER, SANSON, and other authors.

17. 3d, *Lesions affecting the optic nerves.* These consist chiefly of tumours of various kinds — osseous, fibrous, encysted, steatomatous, puriform, aneurismal, &c. — formed in their vicinity, either in the brain, the membranes, or in the bones of the cranium, and involving, or compressing them, in any part of their course. They are likewise, occasionally, the seat of some one, or even more, of those organic changes of their proper structure and sheaths, to which nervous parts are liable. Their vessels may be varicose; their fibres may be infiltrated with serum; they may be injured by external violence, and they may be wasted; which last is very frequently observed. Adventitious deposits, as osseous and earthy matter, malignant formations, cysts and hydatids, may even form in their sheaths, although more rarely than the foregoing lesions. The writings of pathologists abound with instances of these changes. When only one eye has been amaurotic, the optic nerve of that side has been found wasted anterior to its partial decussation; and on the opposite side, posterior to this union. But this is by no means an uniform circumstance, and, when observed, the atrophy is not distinctly continuous. Indeed, the wasting has been detected on the same side, after the union of these nerves, as well as before. But if the opinion of TREVIRANUS and WOLLASTON be correct, — that decussation of these nerves at their union is only partial, and that it takes place chiefly between the parts which are nearest each other, — wasting of one of them may be in one case more remarkable on the same side, and in another case more observable on the opposite side. When the amaurosis is accompanied with wasting of the optic nerve, from causes not primarily consisting of inflammation or its consequences in the retina or adjoining coats, this nervous expansion is also generally wasted, transparent, or changed in colour. When the cause exists in the pineal or pituitary glands, the wasting is often chiefly observable at the union of the optic nerves. In these cases, both eyes are affected. Facts illustrative of this have been recorded by VIEUSSENS, DE HAEN, RULLIER, RAYER, WARD, and SANSON.

18. 4th, *Lesions seated in the encephalon.* The scope of this article will not admit of further reference to the numerous changes which occasionally produce amaurosis, from their affecting the optic nerves in their different connections with various parts of the encephalon. All the alterations which are described in the articles on *morbid structures of the* BRAIN and ITS MEMBRANES, will produce the disease, when they impede the functions of the optic nerves, although the structure of these nerves may be uninjured. The most frequent and remarkable of these are, organic lesions of the pineal and pituitary glands (§ 8.), sanguineous and serous effusions, various kinds of tumours, abscesses, softening of the brain, &c.

19. 5th, *Lesions of nerves subsidiary to the integrity of the organ and of its functions.* Injuries, compression, and even irritation of the fifth pair of nerves, particularly its ophthalmic branch, of the third and sixth pairs, and of the ganglia or their ramifications, by organic change in the brain, its membranes, bones of the cranium, or parts in the course of their branches, have been shown, in numerous instances, to have been the chief efficient causes of amaurosis.

20. III. SYMPTOMS. — The symptoms of amaurosis are, 1st, those which the *patient himself experiences;* and 2d, those which the *physician detects* in the eyes, or in the various organic and animal functions. Each of these classes of symptoms are to be enquired into separately, commencing with either of them. Each eye should be carefully and separately examined; and it will be better that the other is excluded from the light, whilst the examination is being made.

21. 1st, The patient complains of impaired vision, which may be of gradual accession, or remarkably sudden, and amounting to almost total deprivation of sight. Hence the disease has been distinguished by the epithets *slow* and *sudden, incomplete* and *complete,* or *imperfect* and *perfect.*

22. At the commencement, the failure of vision is sometimes only occasional, for a short time, and after longer or shorter intervals (*amaurosis vaga*). In some cases, it assumes the form of *day-blindness,* in others of *night-blindness:* and it not infrequently recurs for a time after great exertion of the eyes, either with minute or bright objects. Transient and sudden attacks of the disease are often the consequence of disorder of the digestive organs, or rather the result of a state of the vital manifestations which occasions equally loss of sight as well as loss of the digestive functions. The failure of sight is often at first only partial — extending only to a part of the field of vision. In some cases intervening portions of the field are obscured (*visus interruptus*). In other cases, one half of it is hid from view (*hemiopia*). Occasionally objects are only seen in a particular direction (*visus obliquus*); and some patients discern objects in a distorted form — crooked, mutilated, shortened, lengthened, or inverted (*visus defiguratus*). BEER states that the flame of a candle will often appear elongated, and as if separated into several portions, to such patients, — a symptom indicating disease within the head.

23. In some instances the failure of sight assumes a *myopic* or a *presbyopic* form: but this is not so frequent as the occurrence of false impressions, in the form either of flashes of light, shining stars, globes of light, and various other lucid spectra (*photopsia*), or of muscæ volitantes. False impressions of colour (*chrupsia*) are also frequent attendants on the early stages of amaurosis. Luminous spectra are commonly met with in plethoric

persons, and when the amaurosis depends upon increased vascularity, or inflammation of the retina; motes, black specks, muscæ volitantes, and thick mists or clouds, when the affection is dependent upon exhaustion of the sensibility and vital energy of the organ, and when it occurs in dyspeptic subjects from exhausting causes. Double vision is also a common symptom, particularly when the cause exists within the head.

24. As the disease advances, the field of vision appears as if obscured by a cloud, or net-work; the latter appearing grey or black in a good light, but occasionally becoming white, silvery, yellowish red, and luminous in the dark. In addition to these, the patient sometimes complains, particularly early in the disease, of some intolerance of light, or of pain in the eyes on being exposed to it. But, in other cases, from the very beginning, diminished sensibility of the retina, and a constant desire for a stronger light — a thirst of light — are present.

25. Pain in the eyes, and commonly also in the head, is one of the most important symptoms of amaurosis. It should, therefore, be carefully investigated. We ought to ascertain its precise seat and extent; its character — whether it be acute, gravative, throbbing, occasional, or permanent. The circumstances which relieve or exasperate it should also be noted; as the horizontal posture, temperature, exercise, diet, the use of stimuli, &c. We should also notice whether it be accompanied with vertigo, tinnitus aurium, watchfulness, or stupor, coma, forgetfulness, inability of exertion, or failure of other mental manifestations; as, from the nature and grouping of these symptoms, we infer the nature of the efficient cause of the disease, particularly as they suggest its existence within the cranium.

26. Unusual dryness of the eyes and nostrils sometimes is observed in amaurosis; and in these cases benefit is often derived from a restoration of the secretions of the lachrymal gland, conjunctiva, and Schneiderian membrane. (Mackenzie.)

27. The general health, and previous ailments of the patient, require a particular investigation. The constitution and diathesis — whether he be strumous or gouty; whether he has had syphilis, or undergone long courses of mercury; whether he has had typhoid fevers, or inflammations of the brain, or apoplexy, paralysis, epilepsy, or injuries on the head; whether he has been subject to complaints of the digestive organs, or has been, or is, affected with worms: if a female, whether she has been frequently attacked with paroxysms of hysteria, or any of its anomalous forms, or with convulsions in the puerperal state, and particularly whether or no there exist any sign of disorder in the uterine organs — are all particulars most requisite to be known.

28. 2d, The form, colour, vascularity, and mobility of the different parts of the eye, and habit and appearance of the patient, next require investigation. The amaurotic patient walks with a gait of uncertainty, and a staring and unmeaning look. In some cases this want of convergency of the eyes towards an object may amount to slight squinting, occasionally with oscillation, and sometimes with unusual fixity of the eyes. In some instances, the motions of the eyelids, and of the eyes themselves, are more or less impeded, or even palsied, — the evator palpebræ superioris, and the orbicularis palpebrarum being often affected. These phenomena are chiefly remarked in cases where the motor oculi, or the facial nerve, is injured.

29. One or both eyes are often unusually prominent. The colour of the sclerotica is frequently somewhat changed — being either yellowish, bluish, or ash-coloured. This coat is often covered with small varicose veins. The consistence, also, of amaurotic eyes is occasionally altered; in some cases the eyeball is firmer to the touch, in others softer, than natural. In rarer instances, it is flattened on one or more of its sides.

30. The pupil is generally sluggish and limited in its motions, or altogether deprived of motion, and dilated. More rarely it is contracted. In many cases it is neither dilated nor contracted. A widely dilated pupil, although generally attendant on pressure on the brain, also occasionally depends on other causes. Early or incomplete amaurosis is rarely attended with dilated pupil; but after all vision is extinct, the pupil is generally more or less expanded and motionless. It should not be overlooked, that where only one eye is amaurotic, the motions of the pupil of the affected organ will often follow those of the sound one, when protected from, or exposed to light; and even, as observed by Janin, both eyes may be completely amaurotic, and yet both pupils will vary in diameter with the intensity of light to which they are exposed. This phenomenon can only be explained by referring to the nerves supplying the different parts of the organ. The iris, being chiefly supplied with ganglial nerves, will often retain its faculty of motion, when the efficient cause of the disease affects the optic nerves at any place between their origin and their communication with the third pair; or when the affection of the optic nerves within the cranium does not leave the retina altogether deprived of sensibility, although the impression cannot be conveyed to the brain, the subsidiary nerves, particularly the third and fifth pairs, and the branches from the cavernous and lenticular ganglions, still bestowing sufficient sensibility and mobility on the iris to admit of motion on being stimulated.

31. Besides the size of the pupil, it is necessary to attend to the characters of the motions of the iris. This part may contract on one side, or in one part, drawing the pupil to one side, or giving it an irregular appearance. It may also seem as protruded towards the cornea, or it may appear sunk inwards, and have a funnel-like shape. (Mackenzie.)

32. The appearance of the humours of the eye is also important. In hydrocephalus, or when occurring in young subjects, the pupil has the natural black hue. But in elderly subjects some degree of glaucoma accompanies amaurosis. This appearance is in general unfavourable.

33. The presence of the marks of injuries about the face and head is important, as marking probable injury of parts within the cranium, or of some nerves subservient to the perfect condition of the organ. The character of the countenance, the shape of the head, the state of the vessels of the head and eyes, and the general habit of body, require to be noticed. The inference which ought to be drawn as to the exact nature of the disease will be very different when it is met with in the plethoric, the highly fed, and the indolent, from that which will be deduced from its occurrence in

the emaciated, or exhausted subject. The probable predisposing and exciting causes should also be investigated, as they have an obvious relation to their effects. Attention should be directed to the previous habits, indulgences, ailments, occupations, and modes of life of the patient, &c., with the view of throwing light upon the causes and pathological relations of the malady.

34. The *duration* of the disease is extremely various. It may, in slighter cases, be only of a few hours' or days' continuance; may altogether disappear, either spontaneously or from treatment, and never afterwards recur; or it may return after an indefinite period, from errors in diet, disorders of the digestive organs, or from the operation of the causes usually producing the disease. It very frequently continues all the life of the patient.

35. IV. STAGES, GRADES, AND FORMS. — The stages of amaurosis are *incipient* and *confirmed*. In the former the sight is generally not altogether lost, although more or less impaired. Treatment will often retard or check the progress of the disease, and sometimes even bring about a perfect cure. But the blindness may be complete from the first: in this case, medicines are generally without effect. In the *confirmed* stage, the disease is usually stationary; but the sight is not always altogether lost: the patient often retaining a perception of light and shadow, or even of objects, when illuminated or strongly contrasted. When this power of distinguishing any object or colour is still retained, even in the slightest degree, the amaurosis is said to be *incomplete*. When the patient is insensible even to the presence of light, the disease is *complete*. It may be limited to one eye, in the incipient or incomplete states; or it may affect both equally, either in an incomplete or complete form. It may also be incipient in one eye, and confirmed in the other; and it may be more or less complete in either. It may likewise, in one or other of these states or forms, assume a *recurrent* or *remittent* type; but such cases are comparatively rare.

36. But, besides these stages and grades of the disease, other forms occasionally present themselves, which will be more fully noticed in the sequel. It may be *Idiopathic*, depending upon changes, either *functional* or *organic*, taking place *primarily* in the nervous apparatus of the eye, and existing *simply*, and without any other associated lesion: or it may be *complicated* with lesions of adjoining parts, or with other diseases of the eye, particularly of its humours, more especially with glaucoma and cataract. It may also be *consecutive* of other diseases; most frequently of organic changes within the head, or in the vicinity of the orbit, as in apoplexy, paralysis, &c. And, lastly, it may be *symptomatic* of, or supervening to, pre-existent disease of distant parts, particularly of the abdominal viscera; or it may be occasioned by pregnancy, and more rarely by diseases of the puerperal state. It is not infrequently thus symptomatic of colic from lead, accumulations of fæcal matters in the large bowels, hypochondriasis, &c.

37. According to these *states* of the disease, its different *species* will next be considered, and the treatment which is appropriate to each of them will subsequently be pointed out: for it is obvious, that the success of remedies will, in this very difficult and variously complicated disease, mainly depend upon the strict appropriation of remedies to its different varieties and states.

38. *Spec.* 1st, *Functional Amaurosis*. This form of the disease generally arises, — 1st, from suspension or exhaustion of nervous and sensorial power; from various local and constitutional causes (§ 13.); from inordinate excitement or exertion of the visual organs; from mental exertion, watchfulness, and sedentary habits; from the deleterious action of mineral, vegetable, and animal poisons, as lead, mercury, narcotics, &c.: 2d, from venereal indulgencies; excessive secretions and evacuations; depression of the vital energies from diseases of debility and exhaustion: and 3d, from temporary diminution of the local circulation; from simple congestion, or occasional determination of blood in the veins or arteries; and from the irritation or disturbance of the digestive organs, or of some other of the abdominal viscera.

39. The *symptoms* of this species are, chiefly, more or less obscuration of vision, occurring slowly or suddenly, the visus nebulosus, and muscæ volitantes; a somewhat contracted pupil, and clear state of the humours; equal imperfection of sight in both eyes; pale, languid countenance, and depression of the eyes in the orbits; a languid, small, or weak pulse; increased dimness, or sudden abolition of sight upon quickly assuming the erect, from the horizontal posture. An improved state of the sight after a light meal, or grateful stimulus; nervous headachs; weak digestion, sluggish state of the bowels, flatulency, foul or loaded tongue, and indisposition for, as well as incapability of, physical or mental exertion or occupation; weakness in the joints; occasionally nocturnal emissions, &c. in the male, and leucorrhœa in the female.

40. This species of amaurosis may be, 1st, *primary*, and *uncomplicated*. In this case it usually proceeds from causes which depress or exhaust the sensibility of the retina and its related nerves. 2d, It may likewise be *consecutive;* particularly of excessive secretions and discharges from the uterus, mammæ, kidneys, testes, and prostate; or from exhausting and debilitating diseases, as adynamic diseases, hæmorrhages, &c. 3d, *Symptomatic* of, or *complicated* with, hysteria, hypochondriasis, colica pictorium, diminished vital energy of the digestive organs, and all the various forms of indigestion; the presence of worms in the bowels; pregnancy; obstruction and accumulation of bile in the bile-ducts or bladder, &c.: and 4th, *Metastatic*, or supervening upon impeded or checked secretions and discharges; in which cases it is generally accompanied with congestion, or determination of blood to the head, in which the eyes may partake, but not to an extent constituting inflammatory action or organic change; and it assumes a state nearly approaching to that characterising the next species.

41. *Spec.* 2d, *Amaurosis from active congestion*. The existence of this species of the disease is more a matter of inference, than almost any other of those in which I have divided the disease. Yet it seems undoubtedly to exist; especially when amaurosis is consequent upon obstructed secretions and discharges, or the drying up of eruptions; upon frequent stooping, or wearing a tight neckcloth; upon fits of passion, when it occurs in plethoric persons; and after narcotic poisons.

42. The *symptoms* indicating it, are throbbing in the eyes, tinnitus aurium, turgescence of the vessels of the sclerotica and conjunctiva, a some-

what contracted pupil, and clear state of the humours; turgescence of the features, or lividity or bloatedness of the face; fulness of the jugular veins, prominence of the eyes, and impeded circulation through the lungs or cavities of the heart.

43. This form of the disease is seldom *primary* and *uncomplicated*. It is commonly *consecutive*, or *symptomatic*, generally of obstructed discharges, &c. (§ 12.), of disease within the head, particularly of sanguineous congestions, or effusions, and diseases of the lungs and heart. It not infrequently occurs transitorily from pregnancy, epilepsy, and hysteria; and more rarely from gout and rheumatism.

44. *Spec.* 3d, *Amaurosis from inflammation of the retina, and internal parts of the eye.* In stating amaurosis to be often a symptom merely of retinitis, I am supported by the opinions of many of the best British and Continental writers on the disease. But I believe it very seldoms occurs, that the inflammation is limited to this membrane, but that the choroid and iris generally participate with it in the morbid action; and that, when they, on the other hand, are thus affected, the retina is also inflamed. Amaurosis is therefore a consequence of inflammation of the internal structures of the eye: but does inflammation of these parts uniformly produce amaurosis? It is not always consecutive of iritis; and I believe that the retina may be inflamed, and yet but very slight amaurotic symptoms may be occasioned thereby, particularly during the early stages of the retinitis. It is chiefly when the inflammatory action has produced some degree of organic lesion of the affected parts, that amaurosis is manifested.

45. This form of amaurosis generally proceeds from nearly the sames cause as the foregoing (§ 10—12.). It may be produced by syphilis, mercury, eruptive and continued fevers, cold in any form acting upon the eyes or face; suppressed discharges, or eruptions on the head or behind the ears; injuries of the eye and adjoining parts; concussions, and the usual causes of inflammation in other parts.

46. The *symptoms* vary with the extent and intensity of the inflammation. In its slighter states, the progress of the disease, and of the symptoms, is insidious and slow. In these cases, little or no pain is complained of, either in the eye or in the head. The pupil is more commonly contracted than dilated, and the spectra are usually luminous, but sometimes not very sensibly so. With this slight and often chronic state of inflammatory action, the amaurosis may be increasing fast, and the observation of vision very great, and yet the symptoms may not be distinctive; if we except the appearances furnished by the sclerotic, which, in retinitis, as well as in iritis, abounds in red vessels, converging in distinct lines, and forming, by their delicate reticulations, a red zone round the cornea, and which thus furnishes the only symptom, that can be depended upon, of slight or incipient retinitis.

47. In the more intense states of inflammation of the internal parts of the eye, the amaurosis is attended with painful vision; intolerance of light; sparks of fire, or drops of a red colour falling from the eyes; flashes of light; pain darting through the head, either from, or to the bottom of the eyeballs; the pupils are dilated, and the humours thick or muddy; and there are more or less acceleration of pulse and constitutional disturbance.

48. This species of amaurosis is often *primary* or *idiopathic*; it may also be *simple* or *complicated*. When it occurs in a complicated form, it is, most frequently, associated with iritis, with meningitis, with eruptive or continued fevers, and with rheumatism, gout, or syphilis. It may also occur *consecutively*, and from *metastatis*, particularly after the disappearance of exanthematous eruptions, as in the measles, small-pox, erysipelas; of chronic eruptions; and after the suppression of habitual or periodical discharges, secretions, and evacuations (§ 12.).

49. *Spec.* 4th, *Amaurosis from advanced disorganization of the retina and adjoining parts.* Disorganization of these parts is usually a result of inflammation. But it is difficult to determine at what stage of the inflammation organic change commences. I am to consider it here as far advanced; yet, the inflammation that occasioned it may be still present. The *causes* of this species are the same as those of the foregoing; but the *symptoms* are somewhat different. The vision is more obscured. A film seems interposed between the eye and field of vision. The pupil is sluggish, and it is often scarcely dilated; it is frequently irregular. The margin of the iris sometimes partly adheres to the capsule of the lens. The sclerotic is often very vascular, and even livid, from the enlarged and loaded state of its veins, which are very numerous and tortuous. The shape of the eye is sometimes changed, particularly in the most advanced cases; it is prominent in some parts, and depressed in others. The eyeball is occasionally, also, softer or firmer than natural.

50. This form of amaurosis is always *consecutive* of the *second* and *third* species, more particularly of the latter; and hence, participates in many of their characters (§ 41—48.), and occurs under many of the same circumstances as they. It is occasionally *complicated* with cataract, with opacities of the cornea, or with disorganization of parts within the head.

51. *Spec.* 5th, *Amaurosis from external injuries of the eyes.* A blow on the eye-ball will not infrequently occasion blindness, without producing any apparent injury of its visible parts. It is difficult, or altogether impossible, to ascertain the nature of the mischief that has been inflicted. The concussion of the organ, and the lesion of the sensibility of the retina and optic nerve, may, in some of the cases, particularly when the consequent amaurosis is merely temporary, constitute the principal or only change. In more permanent and severe instances, it is very probable that the delicate connections of the retina with the adjoining parts are injured. Ecchymosis may also be occasioned, or inflammation may supervene. In these cases the pupil is either dilated, or of an irregular form; and according to the extent of injury will the phenomena partake of the characters which have been assigned to the *third* and *fourth* species of the disease.

52. *Spec.* 6th, *Amaurosis from disease within the head affecting the functions of the optic nerve, or other nerves subservient to the sense of sight.* It is obvious that disease within the cranium, either of the substance of the brain, or of its membranes,

producing pressure of, or interrupted circulation in, the parts with which the optic nerve is connected at its origin, or during its course, or acting in a similar manner on the nerve itself, will produce amaurosis. In these cases it is a *consecutive* affection — a symptom merely of disease, often existing for a long time previously. I have already alluded to the nature of these lesions, and to their extreme diversity (§ 17, 18.). Perhaps the most common and the most interesting of them are organic changes of the pituitary and pineal glands, hæmorrhage, sanguineous congestion, aneurismal and other tumours, &c. In these cases it is very common to find cerebral symptoms complained of long before the sight is affected; and to observe the gradual accession of the disease either in one or both eyes; or first in one and afterwards in another, with complete loss of vision, followed at last by changes of the structure of the eye.

53. When organic lesion of the pituitary and pineal glands has occasioned the disease, judging from the cases recorded by De Haen, Wenzel, Vieussens, Leveque, Ward, Rullier, and Rayer, both eyes are generally gradually and equally affected, after the existence of cerebral symptoms, chiefly consisting of pain and weight referred to the more anterior parts of the head; of a repugnance to exertion, apathy, loss of memory, and weakness of the mental energies. In cases of sanguineous congestion, or hæmorrhages in the situations referred to, the attack is sudden, and the blindness is often not the most remarkable symptom.

54. In some cases resulting from organic disease within the head, cerebral symptoms, particularly those of an acute kind, are not complained of until the amaurosis is far advanced. In its progress, objects frequently seem to the patient disfigured or perverted. In many cases of amaurosis from organic change of the skull, membranes, or brain, the affection commences with intolerance of light, strabismus, giddiness, luminous spectra, convulsive motions of the eyes and eyelids, contracted pupil, and turgescence of the blood-vessels of the eyes, loss of hearing, smell or taste, or both, violent headach, rapidly followed by complete amaurosis, protrusion of the eyeball, and abolition of the external senses and of the powers of mind.

55. This species of amaurosis is often *complicated* with, or preceded by, epilepsy, paralysis, apoplexy, ottorrhæa, or disease of the ears, hysteria, and various nervous effections. It is chiefly by attending so these antecedent disorders, or other slighter cerebral symptoms, that we can form any idea of the nature of the amaurosis. The appearance of the eye, and particularly of the pupil, is not to be depended upon; for, although the pupil is usually dilated and immoveable, the exceptions are too numerous to admit of considering it as an uniform occurrence.

56. *Spec.* 7th, *Amaurosis from disease of the optic nerves, or of their sheaths.* This species of amaurosis always advances slowly, generally commencing in one eye, with a black cloud, which grows more and more dense, great disfigurement and perversion of objects, without pain of the head or eye. There is, however, a sensation of pressure at the bottom of the eye, as if forcing the eyeball from its socket. The pupil is generally, from the commencement, much dilated, and angular from irregular action of the iris. By degrees, according to Beer, glaucomatous change of the vitreous humour supervenes, and afterwards of the lens itself, but without any varicose affection of the vessels of the eye. At last the eyeball becomes somewhat smaller than natural, but complete atrophy does not ensue.

57. *Spec.* 8th, *Amaurosis from lesions of branches of the fifth nerve*, &c. The experiments of Bell and Magendie first threw light upon this cause or form of amaurosis. I believe that it is by no means infrequent. Four cases of it have come before me in private practice; in three of which the principal trunk or branches of the ophthalmic nerve were implicated. In one of these the amaurosis was very slight; in the other two it was very considerable, although not complete, and was a consecutive phenomenon of very extensive disease. I saw two of them, in consultation with respectable practitioners in my vicinity. The fourth case very recently occurred in a member of my own family. In it the frontal branch on the right side was pressed upon by a common boil; the sight of the eye was nearly altogether lost, but was soon restored when the boil broke.

58. Numerous cases are on record, in which partial amaurosis is said to have occurred after injuries and wounds of the eyebrows, cheeks, and forehead; or from the irritation and extraction of diseased teeth. The appearance of the disease from these causes was noticed by Morgagni, Pinel, Beer, Wardrop, Travers, Penada, Ribes, &c., before the functions of this nerve were so well known as they are now. Its occurrence from wounds of the eyebrows is mentioned even in the writings of Hippocrates.

59. Amaurosis from these causes is, in some rare instances, *complicated* with facial neuralgia, toothach, rheumatism of the face, and tumours or abscesses developed in the vicinity of the eye, and within the cranium in the course of the fifth nerve. I met with it in a case of ottorrhæa, terminating in caries of the bones, and extensive disease of the internal parts in the vicinity. It is also, in some cases, accompanied with paralysis of the upper lid, and in others with paralysis of different muscles of the eye. In these cases, the third or sixth nerves have, most probably, been chiefly affected. When the ophthalmic nerve is affected within the cranium, it is difficult, if not impossible, to determine the particular seat of lesion from the amaurotic symptoms. Facts have not been observed in sufficient number, and with requisite precision, to admit of any statement being made respecting the pupil and motions of the iris in this species of the disease. I believe, however, that serious organic, as well as functional, lesions of the organ may supervene to it.

60. There are other varieties of amaurosis particularised by Beer, Weller, Sanson, and other German and French writers, some of them of rare or doubtful existence, or at least referrible to the species into which I have here divided the disease. From amongst these I may enumerate the following: — Gouty amaurosis; rheumatic amaurosis; amaurosis from the sudden repulsion, or cure of cutaneous eruptions, or old ulcers; amaurosis from suppressed secretions and evacuations; puerperal amaurosis, &c. It is

evident that these are only occasional, and by no means frequent, causes of the disease, which ought to be kept in recollection by the practitioner, but which can act only by inducing some one or other of the forms into which it has been divided; more particularly the *second*, *third*, *fourth*, and *sixth*. In as far as they may require a modified plan of treatment, they will receive attention in the sequel.

61. In addition to these, I may notice the *cat's-eye amaurosis* of BEER, which is only met with in the old, debilitated, thin, and emaciated; particularly those who are grey, or white-headed. At the commencement of this amaurosis, the iris retains its mobility; but it afterwards is slow and the pupil dilated. Deep in the bottom of the eye, a concave pale grey, or yellowish green, or reddish, variegated opacity is observed. The further the disease advances, the paler the bottom of the eye becomes, the paleness extending to the iris, until at last a slender vascular plexus — the ordinary ramification of the central artery and vein — may be discerned. With this state of the eye, decline or total abolition of vision is the consequence. This rare form of amaurosis seems to consist of a deficiency of the pigmentum nigrum, and of the tapetum of the uvea. It appears closely allied to far advanced glaucoma. This form of the disease is seldom or ever benefited by medical treatment.

62. V. DIAGNOSIS. — Amaurosis is liable to be mistaken for incipient *cataract*, and for *glaucoma*. When *cataract* is fully developed, the two diseases can scarcely be confounded. That a clear diagnosis should be made between incipient cataract and amaurosis is of the greatest importance in practice. (*A*) As to the impaired vision in both diseases at their commencement, it may be remarked that in *cataract*, the difficulty of sight increases very slowly, and is compared to a diffused mist, thin cloud, or gauze intervening between the eye and the object: whereas in *amaurosis*, the dimness or loss of sight is either sudden or partial, resembling a fly, spots, or motes covering parts of an object. However, a mist, or thin cloud, often is complained of in incipient amaurosis, and, increasing in density, at last deprives the patient of sight; but a complete deprivation of sight never occurs in cataract. As incipient cataract depends upon commencing opacity, generally at the centre of the lens, the appearance of a mist, &c., is generally most perceived when the patient looks straight forward; vision being more distinct when he looks sideways. This commonly does not obtain in amaurosis, although it sometimes does.

63. (*B*) The degree of light which the patient desires is also important. When amaurosis depends upon insensibility of the retina, there is a great desire of strong light, and he sees the best at noonday, or when objects are brilliantly illuminated. The opposite of this obtains in cataract; for a strong light, causing the pupil to contract, the rays of light reflected from the object must pass chiefly through the central and more opaque part of the lens. In addition to this we should attend to the antecedent and attendant symptoms of amaurosis; especially vertigo, headach, disorder of the digestive organs, without which cataract usually commences.

64. (*C*) Upon examining the pupil, incipient amaurosis presents either the jet-black colour of health, — excepting in the cat's-eye amaurosis of BEER, which is of rare occurrence, and presented to us under circumstances not to be mistaken, — or a paleness or greenness, visible only when the eye is examined in particular directions, constituting amaurosis with *glaucoma*. This appearance evidently arises from deficiency of the pigmentum nigrum, and incipient dissolution of the hyaloid membrane; and when it amounts to a high degree, constitutes the cat's-eye amaurosis of BEER.

65. Mr. MACKENZIE remarks on this subject, that attention to the following circumstances will generally enable the observer to distinguish glaucomatous amaurosis and cataract: — 1st, The opacity in glaucoma is always greenish, whereas in incipient cataract it is always greyish. 2d, The opacity in glaucoma appears seated at a considerable distance behind the pupil, or deep in the vitreous humour; whereas in lenticular cataract, the opacity is close behind the pupil. In posterior capsular cataract, the opacity is deep in the eye, but is always streaked; whereas the glaucomatous reflection is always uniform, never spotted, nor radiated. 3d, Upon close examination of the surface of lenticular opacity by means of a double convex lens, it is seen slightly rough, somewhat dull, never smooth or polished — forming, in these respects, a striking contrast to the appearances presented by glaucomatous opacity. 4th, The eyeball, in glaucomatous amaurosis, always feels firmer than natural; while in cataract it presents the usual degree of firmness. 5th, Glaucoma proceeds very slowly in its course, scarcely increasing for years; whereas the vision, in cataract, much more rapidly declines, and keeps pace with the growing opacity.

66. (*D*) The mobility of the iris is a principal source of diagnosis. For, in incipient cataract, the contractions of the pupil are as extensive and as vivid as in health; but, in incipient amaurosis, the pupil is either dilated and fixed, or its motions limited and slow. Also, in the latter disease, the movements of the eyeballs and eyelids are often imperfect, or difficult; whereas no impediment of this description exists in cataract. In many cases of amaurosis, we observe a want of direction in the eyes, or a slight degree of strabismus, not infrequently with a want of power over the motions of the upper lid, — symptoms that never occur in cataract.

67. VI. PROGNOSIS. — This is unfavourable. When the cause of the disease is evident, and it is merely functional, or simply congestive or inflammatory, and the patient young, or in the prime of life, but under middle age, a complete cure is not infrequent. This may be obtained although much more rarely, even when the loss of sight is total. But in every case the predisposing and exciting causes, and the effects of remedies, must be taken into account in forming our prognosis. Much more commonly only partial amendment is produced. Amaurosis is generally less unfavourable when suddenly, than when slowly induced. When the pupil is only slightly dilated, still moveable, of its natural form, the eyeball neither firmer nor softer than in health, and no glaucoma present, the prognosis is obviously more favourable than when the pupil is fixed in the states either of expansion or contraction, or when the eyeball is either boggy or preternaturally hard, or when the bottom of the eye presents a greenish opacity.

68. If the attack has been sudden, and nearly complete, or if objects are seen in a perverted or distorted form or double; if the amaurosis be attended with want of power in the muscles of the eyeball or eyelids, we should suspect that the cause consists of general or partial pressure, or other organic disease, within the cranium, which, although indicating both danger and the permanent loss of sight, will sometimes be removed by energetic treatment. If one amaurotic and paralytic symptom slowly supervene on another, we should dread the gradual developement of tumours, cysts, exostosis, &c. within the head, the situation and nature of which can be suspected only, and chiefly from the nature of the attendant or preceding symptoms. But in all these the prognosis is necessarily very unfavourable.

69. VII. Treatment. — In order to employ remedies in this affection with any degree of benefit, it will be necessary to direct them with a very particular reference to the pathological conditions of the eyes, the brain, and system generally, as now pointed out. Having separated the disease into the foregoing species or varieties, in order that the treatment may be pointed out with greater precision, I proceed to detail the measures which I consider appropriate to each, conformably to the most experienced authors, and to my own observation.

70. *A. Of the first species.* The treatment of this, the most strictly functional form of the disease, should have strict reference to the causes which induced it, — whether those acting directly on the organ, or those which act indirectly, and in consequence of inducing disorder of other parts. When amaurosis proceeds from direct causes, either of a depressing or an exhausting nature, the appearance of the eye, as well as the character of the symptoms, require an attentive examination, chiefly with a view to ascertain the existence of inflammatory action, or even active congestion of the internal parts. A complete removal of the causes must be insisted on; and, if no symptoms indicative of inflammation (§ 46.) exist, but, on the contrary, debility, a languid circulation, *muscæ volitantes*, or dark spectra, &c. (§ 39.), tonics and stimulants, both internally and externally, are required. A light, nutritious, and invigorating diet, with change of air, repose of the organs, moderate exercise, vegetable, and afterwards mineral tonics, and the usual means of improving the digestive organs, and promoting the functions of the bowels and secreting viscera, are in these cases chiefly to be depended on. Small doses of *strychnine*, or of the extract of *nux vomica*, may also be given (Form. 541. 565.). When, however, we find evidence of congestion or increased vascular action of the internal parts of the eye to have been induced, the means to be employed in the next species must be resorted to.

71. When this species of amaurosis proceeds from interruption or disorder of the digestive functions, as indicated by the symptoms of such disorder, by a foul tongue, acidity and flatulence of stomach, and torpid bowels (§ 39.), *emetics*, as recommended by Richter, Otto, Schmucker, Flemming, Scarpa, and Mackenzie, may be exhibited; but, unless the symptoms of interrupted digestion, or of indigestible and injurious substances remaining upon the stomach, or of biliary obstruction, be unequivocally present, little advantage will be derived from them: in plethoric persons, or where these causes of disorder do not exist, they may be even injurious. Amaurosis from disorder of the digestive organ is generally imperfect, and sometimes slight; and its progress slow. In this form, Scarpa recommends *full vomiting* to be produced by the patient taking a spoonful, every half hour, of a solution of three grains of tartar emetic in four ounces of water; and, on the following day, opening powders to be commenced with, consisting of an ounce of supertartrate of potash and one grain of tartarized antimony, divided into six equal parts. The patient is to take one of these parts in the morning, another four hours afterwards, and a third in the evening, for eight or ten successive days. The effects of these are, nausea, and increased evacuations from the bowels; and, in the course of a few days, vomiting. If, during their use, the patient should complain of a bitter taste in the mouth, vain efforts at vomiting, and no improvement of sight, the emetic, as at first directed, is to be again taken; and this is to be repeated a third or fourth time, if the bitter taste, acid eructations, nausea, &c. continue. The repetition will often at last succeed in procuring the discharge of a yellowish or greenish matter from the stomach, to the relief of the head and eyes.

72. The stomach, and through it the liver, having been thus acted upon, the following resolvent pills of Schmucker are to be taken, to the extent of fifteen grains, night and morning.

No. 11. ℞ Gum. Sagapen., Gum. Galbani, Sapon. Venet. āā ʒj. ; Rhei ʒjss. ; Antimonii Tartarizati gr. xv. ; Succ. Liquor. ʒj. Divide in Pilul. gr. iij.

These pills are to be continued for four or six weeks. Instead of these, the pills recommended by Richter may be prescribed.

No. 12. ℞ Gum. Ammoniaci, Gum. Assafœtid., Sap. Venet., Rad. Valerian., Summit. Arnicæ, āā ʒij. ; Antimonii Tartar. gr. xviij. ; Syrup. q. s. M. et divide in Pilulas gr. iij.

From twenty to thirty grains are to be taken three times a day for some weeks.

73. If these succeed in improving the state of the stomach and sight, Scarpa directs means calculated to strengthen the digestive organs, and nervous system: such as the daily exhibition of bark and valerian, more particularly in periodic amaurosis; a light, digestible animal diet, with a moderate quantity of wine, and wholesome air and exercise. He further prescribes, as advised by Thilenius and Moriggia, the *vapour of liquor ammoniæ* directed to the eye, with the view of exciting the nerves of the organ; and employed, three or four times a day, so as to occasion each time a copious secretion of tears. In conjunction with the use of this vapour, other external stimulants, as blisters to the nape of the neck, behind the ears, or to the temples; irritation of the nerves of the nostrils by sternutative powders; and, lastly, sparks of electricity may be resorted to. Various volatile substances, spirituous, saline, and oleaginous, have been recommended to be applied to the eyes, either in a state of vapour, or of solution and dropped into them, by Warner, Sagar, Manardus, Denckler, Chomel, St. Yves, and Schmucker; but these require to be cautiously resorted to. Substances of a like description have also been prescribed in the form of *collyria*, in this species of amaurosis. Plenck recommends for this purpose a drachm of the *crocus metal-*

lorum dissolved in rose water; or a portion of the following: —

No. 13. ℞ Spirit. Lillior. Conval., Spir. Lavand., Spir. Rorismar., Muriatis Ammon., ãã ʒj.; Spir. Bals. Vitæ Hoffman. ʒss. M.

to be poured in the palm of the hand, and held before the eyes. The application of cold and slightly stimulating washes and baths to the eye, and bathing the whole head, or eyes, in cold water, have been approved by Richter and Beer. Mr. Travers, however, states, that he has never obtained any decided advantage, in amaurosis, from applications made directly to the eyes. Both electricity and galvanism have received the recommendation of Ware, Lentin (*Beyträge*, iv. b. p. 102.), and Ossiander (*Abhandl. Med. Soc. zu Erlang.*, i. b. No. 8.). *Moxas* applied in the course of the facial nerves have been used by Larrey; and the *actual cautery* behind the ears by Khlodovitch. (*Archives Génér. de Méd.*, t. xvi. p. 452.)

74. In this species of amaurosis, both in cases of the above description as well in those which proceed from the over exertion of the sight, the *external application* of *strychnine* promises to be of considerable advantage. Mr. Liston, Dr. Short (*Lond. Med. Gaz.*, vol. v. p. 541.), and Dr. Heathcote (*Medico-Chirurgical Rev.*, July 1830.), have thus employed it with decided benefit. After blistering the temples, and removing the cuticle, from one eighth to one fourth of a grain of pure strychnine was applied to the denuded surface on each side daily, and the application renewed each day, and gradually increased to a grain. In one case the quantity was increased to three grains, but it is seldom requisite, and it may sometimes not be safe, to exceed half this quantity. In some cases it will be necessary to re-blister, oftener than once, the surface, after repeated applications of the strychnine. Cataplasms of *capsicum* have also been employed with advantage to the temples. Gahn mentions them with approbation; and I have seen them used in amaurosis with decided benefit by the native doctors in warm climates. Hoffmann and Trew employed the cajeput oil in this manner, and Warner the animal oil of Dippel.

75. Mr. Travers and Mr. Lawrence are not advocates for the use of *emetics*. The former prefers to remove the gastric disorder by a course of blue pill, with gentle saline aperients and vegetable tonics. He recommends the combination of blue pill with colocynth, rhubarb, and aloes; and of soda with columba, gentian, or rhubarb; with the view of promoting or regulating the abdominal functions. After these he advises the use of general tonics, as the mineral acids, bark, steel, and arsenic. Mr. Lawrence chiefly approves of attention to the general health, by residence in a pure air; out-of-door exercise; mild, plain, but nutritious food; gentle aperients, and occasionally an active purgative; repose of the affected organ; counter-irritation by a succession of blisters, an open blister, or setons. Beer is also against the use of emetics. He prefers the employment of brisk cathartics; followed by the use of anthelmintics, when we suspect the presence of worms in the bowels. Rubefacients, stimulants, and blisters to the temples and eyebrows, are favourably mentioned by him.

76. There can be no doubt of the propriety of the measures recommended by the above writers: but are we to remain content with them alone, in cases where amendment from them is either slow or not apparent? I think not; and therefore are we required to devise additional means. Those already recommended by the eminent Continental authorities, as stated above (§ 71, 72.), and the external medication already described (§ 73, 74.), have both authority and reason in their favour, if duly followed. But it may be useful to suggest others. For, in cases of this disease, the practitioner will have reason oftener to regret the want, than to be perplexed by a diversity, of rational resources.

77. After having had recourse to evacuations, to emetics with great caution, and under the circumstances stated above (§ 71.), always to aperients, alteratives, and occasionally to brisk purgatives, promoted by enemata, suited to the peculiarities of the case, and repeated as long as the secretions are impeded, and the evacuations offensive, or of an unhealthy colour, other internal means must be sought for, if necessary. Amongst these, in this species of the disease, *camphor*, combined with *arnica*, and in considerable doses, has been recommended by Flemming (*Hufeland's Journ.*, *&c.*, Jan. 1810, and May 1812.); the *rhus toxicodendron*, or the *rhus radicans*, in the form of tincture, by Basse and Hufeland (*Journ. der Pract. Heilk. &c.*, Jan. 1811.); and *phosphorus*, by Loebel (*Horn's Archiv.*, Nov. 1812, p. 397.) Musk, castor, assafœtida, valerian, and zinc, have also been favourably noticed by Beer.

78. It is chiefly in this form of the disease that advantage, if any, will be derived from the use of *aconitum*, which, however, has received the approbation of Boehmer, Collin, Stoeller, Reinhold, Gesner, and other respectable authorities, particularly when the affection is connected with chronic rheumatism, or atonic gout, or occurs in the gouty and rheumatic diatheses. *Guaiacum* has been recommended by Wintringham; and, under the circumstances of disease now alluded to, particularly when combined with camphor and ammonia, and given after due alvine evacuations have been procured, is calculated to prove beneficial. The *arnica montana*, which has been prescribed by Baldinger, Collin, Franck, Thilenius, and Angeli, is applicable to this form of amaurosis only. It is most probably from having employed it in very different states of the disease, — in the inflammatory, or those depending upon organic change within the head, — that it has been disapproved of by Richter and Schmucker.

79. The chief *complications* of functional amaurosis require no very different treatment to that which has been described. The not infrequent association of the disease with *worms* demands the use of anthelmintics, followed by purgatives, and the administration of vermifuge enemata, &c. (see Art. Worms.), and afterwards by vegetable or mineral tonics. But, in the majority of cases of even functional amaurosis, the use of the preparations of iron requires caution. When the disease is occasioned by lead, or accompanied with the *lead colic*, or attended by paralysis of any other parts of the body, the exhibition of calomel, with camphor and small doses of opium, followed by purgatives, and antispasmodic and aperient enemata, is extremely serviceable. After the secretions and functions of the abdominal viscera are restored by these means, *strychnine*, or the

extract of nux vomica, may be prescribed both internally and topically. (FORM. 542. 565.) The connection of the disease with hysteria, hypochondriasis, obstructions of any of the abdominal secretions, chiefly requires the combination of antispasmodics with aperients; chlorine, iodine, or sulphureous baths; the occasional exhibition of a brisk purgative; and, afterwards, the warm salt water bath, tonics with stimulants, and strict attention to the secretions and functions of the digestive organs, and to diet, air, and exercise. After all obstruction is removed, cold bathing, or chalybeate or salt water baths, followed by frictions of the cutaneous surface, may be used.

80. *B. Of the second species.* When amaurosis is attended with those symptoms which I have described as marking active congestion of the internal parts of the eye, or of the head or thoracic viscera (§ 41.), a very different treatment to that enjoined above is requisite. In the first species of amaurosis, *bloodletting* is generally prejudicial — it has even caused the disease: but in the congestive species, bloodletting, either general or local, or both, according to the circumstances of the case, is indispensable. In every form of the disease the means of cure must be regulated by the apparent vascularity of the eye, the plethoric state of the countenance and body, and by the state of the arterial pulse, examined not only at the wrists, but also in the carotids and temples.

After depletion, to an extent which the well-informed practitioner will be led to adopt according to the particular characters of the case, the promotion of the alvine discharges, and of the cutaneous and alvine secretions, will next require his attention, as salutary modes of derivation and evacuation; and afterwards the application of blisters, setons, issues, and other counter-irritants, behind the ears, or to the nape of the neck, will generally be necessary to complete, or to render permanent, the cure. The tartarized antimonial ointment, moxas, the mezereon issue, the actual cautery to the nape of the neck, or to the occiput, and errhines, have severally been recommended by eminent Continental writers in this state of the disease.

81. The *shower bath*, sponging the head with cold water night and morning, the *cold douche*, or the effusion of a stream of cold water on the head, are means which ought not to be neglected in those cases in which the congestion is of an active character, or approaches to the inflammatory state. When this form of the disease is consecutive of interrupted or suppressed discharges or evacuations, the restoration of these must be attempted. If the menses be suppressed, leeches to the pudenda, or the insides of the tops of the thighs; or bleeding from the feet; the preparations of iodine, aloetic purgatives, and other emmenagogues; stimulating pediluvia, and the *hip bath*, with the other means usually resorted to in cases of amenorrhœa, are to be employed. If it proceed from suppressed hæmorrhoids, leeches may be applied to the vicinity of the anus, and purgatives, with calomel, colocynth, and aloes, prescribed. If it supervene on the disappearance of gout or rheumatism, sinapisms and irritating cataplasms may be directed to the extremities, and free alvine evacuations procured; after which colchicum, combined with alkalies or magnesia, and, in some cases, with ammonia or camphor, may be exhibited, or aconitum combined with antimonials, and purified sulphur; and rubefacients applied behind the ears, or to the temples. When it appears after the suppression of eruptions, and healing of old ulcers, the use of the tartar emetic ointment, setons, and perpetual blisters behind the ears, are particularly indicated. If it follows a suppressed cold, WELLER recommends weak sternutatories, with calomel or hellebore.

82. Mr. TRAVERS has very justly remarked, that a loss of balance of the circulation, producing undue determination of blood to the head, often exists independently of general plethora, and is aggravated by sanguineous depletion. It is sometimes even met with in corpulent persons; and is not infrequent after over-excitement and chronic inflammation. Instead of requiring loss of blood for its removal, this state of the disease demands an equalization of the circulation, by promoting the various secretions, and the derivation of the excessive supply to other parts by the means now stated, assisted by an abstemious and regular diet, gentle exercise in the open air, the promotion of the functions of the liver and bowels, and the means usually employed to benefit the general health. Even in some of these cases, the local means noticed above, as the vapours of ammonia, &c. (§ 73.), may be serviceable in restoring the tone of the vessels of the eyes.

83. *C. Of the third species.* Inflammation of the internal parts of the eye, particularly of the retina, requires decision, in the more intense cases, and a vigorous but judicious application of the usual antiphlogistic remedies. In the slighter cases, the exact nature of the disease may be mistaken for either of the foregoing species. Slight or slow inflammatory action may exist without any material affection of the pulse, or pain of the organ; but the appearance of the blood-vessels of the sclerotic, and the state of the iris, will often indicate its presence when other signs are wanting. When the attack is acute, both general and local depletions are required. In these cases PLENCK has advised the performance of arteriotomy; SPIGELIUS and HOFFMANN, of blood-letting from the frontal vein; and SAUVAGES, from the jugulars. But vascular depletion is not to be relied upon alone. Active evacuations from the bowels, determination to the skin by small and repeated doses of antimonials, and the use of the tartar emetic blister or plaster, behind the ears, or to the nape of the neck, are to be also adopted.

84. If these means fail of producing a very decided improvement in a very short time, we must endeavour to affect the mouth slightly with mercury, without producing salivation. In order that this may be done with rapidity, and with as little mercury as possible, the preparations of this mineral to be employed will be advantageously combined with James's powder, or antimonial powder, and small doses of camphor. The treatment is, in such cases, similar to that usually resorted to in iritis. Much of the advantages to be procured from the use of mercury in this form of amaurosis, as well as in iritis, depends upon the promptitude with which it is employed. In this, TRAVERS, LAWRENCE, MACKENZIE, and others agree. Indeed, the use of calomel, and other

preparations of mercury, either alone, or combined with other substances, has been adopted in the inflammatory states of amaurosis, from the time of HEISTER and BOERHAAVE. BANG, HUDEMANN, SCHMUCKER, ZUICKEN, and BREITING, agree in recommending them. BOETTCHER advises the combination of calomel with belladonna; and HEY, calomel with camphor: both being judicious modes of combining this medicine. MEAD, STAHL, HOFFMANN, and ISENFLAMM, advise the production of salivation; but I agree with TRAVERS in considering the affection of the mouth as sufficient. The use of mercury is much praised by BEER in such cases, as well as in those of a syphilitic origin, or which are complicated with engorgement of any of the abdominal viscera. Care should be had not to employ it in debilitated or scorbutic persons, and when the eye is soft or boggy. Many of the Continental writers, and Mr. WARE, prefer the sublimate to other preparations. It is best exhibited, as recommended by VAN SWIETEN, dissolved in brandy, and taken in a basin of sago or gruel. It may be continued for six weeks, or even longer.

85. The success which has resulted from the exhibition of the *oleum terebinthinæ* in iritis induced me to prescribe it, after depletions, in two cases of this form of amaurosis; and with satisfactory results in both. In persons far advanced in life, in scrofulous subjects, and in debilitated persons, this oil is certainly a less hazardous medicine than the mercury exhibited so as to affect the system.

86. In the slighter or more chronic inflammatory forms of amaurosis, particularly when met with in the description of subjects just now alluded to, much circumspection is necessary in the use of depletions: general bloodletting is here inadmissible, particularly when this class of patients are ill fed, and live in close and ill ventilated streets and apartments in large towns, and local depletions only are indicated. In cases of this description, and under these circumstances, the oleum terebinthinæ will prove a valuable medicine; and even, although we may deplete thus locally, the internal exhibition of tonics, with a nutritious diet, attention to the alvine secretions and evacuations, and a wholesome air, will prove the most beneficial remedies.

87. This form of amaurosis, as well as the preceding, will occasionally supervene from suppressed evacuations and eruptions, and more rarely from misplaced gout and rheumatism. (§ 48.) In such cases, the treatment already recommended, as appropriate to each of these (§ 81.), will be equally applicable here.

87. Besides the above means, it has been recommended by BROMFIELD, to insert an issue in the scalp; by HOFFMANN, to apply leeches to the insides of the nostrils; by numerous authors, to employ errhines and sternutatives, with the view of provoking a copious secretion from the Schneiderian membrane; and by as many others, to use the actual or potential cautery, setons, moxas, &c. to the nape of the neck, or to the occiput. Leeches and counter-irritants are safe, and sometimes useful, remedies in this and the preceding species; but errhines and sternutatives may be hurtful, unless the affection has arisen from suppressed discharges from the nostrils. They are most serviceable in the functional state of the disease. The safest that can be employed in this species of amaurosis is the one recommended by the late Mr. WARE. It consists of ten grains of the hydrargyrus sulphuratus, well mixed with a drachm of common sugar: a small pinch of it generally produces a copious discharge of mucus from the nose.

89. D. *Of the fourth, and remaining species.* When we have reason to suspect that the amaurosis depends upon advanced organic lesion of the internal parts of the organ consequent upon inflammation, we should still bear in mind that, with the supervention of such lesion, whatever it may be, the inflammatory action seldom altogether subsides, but continues, more or less, in a chronic, atonic, or disorganizing form. Therefore the propriety of still having recourse to local depletions, particularly if these have been neglected early in the disease, to purgatives, derivatives, or revulsants; the cold douche to the head; and, afterwards, to the use of stimulating vapours, when we have reason to suspect that the change continues rather in consequence of lost tone of the vessels, and inaction of the absorbents, than from increased action. Under such circumstances, the vapour of camphor and acetic acid, or of the liquor ammoniæ, may be tried.

90. *a.* If the amaurosis have arisen from *external injury of the ball of the eye*, or concussion of the organ (§ 51.), the chief indication is to prevent, or to repress, increased vascular action, by the means already recommended; to attend to diet and regimen, and to keep the organ in a quiet inactive state for some time; after which, if the affection still continue, the treatment must be directed according to the particular lesion, functional or organic, that may have been primarily or consecutively produced.

91. *b.* When the history of the case leads us to suspect the dependence of this affection upon *disease within the head* (§ 52.), or tumours pressing upon the *optic nerve*, &c. (§ 56.), the treatment must necessarily be directed, according as the symptoms referrible chiefly to the head may lead us to infer the nature of the primary lesion. If such symptoms, particularly the temperature of the head, and the action of the carotids, indicate the existence of congestion, interrupted circulation, or increased action, the treatment must be accordingly. But under almost every circumstance, counter-irritation, and external as well as internal revulsants, will prove safe, and sometimes serviceable, means of cure.

92. If we have reason to suspect the formation of tumours; thickening, or other change, of the membranes or of the bones, particularly as a consequence of syphilis; and extravasations of blood, or of serum, within the cranium, or in the course of the optic nerves, &c. (§ 52.), the internal use of the preparations of *iodine*, and particularly of the *hydriodate of mercury* or of *potash* (see FORM. 323, 324.), should not be overlooked. I have employed these preparations with much benefit in three cases of amaurosis connected with paralysis; two of them consequent upon apoplectic seizures. In the intervals between the courses of iodine, deobstruents, and alterative doses of blue pill, with the extracts of sarsaparilla and taraxacum, or with the decoction or other preparations of sarsaparilla, should be prescribed.

93. *c.* When the affection seems connected with *lesion* of the *other nerves subservient* to vision (§57.), the treatment must necessarily depend upon the seat and nature of this lesion, and, in some rarer cases, upon the state of the associated derangement. If it be connected with neuralgia of the nerves of the face, disorder or irritation of these nerves may exist at their origin, or in their course through the membranes and bones of the cranium. The cause may also be external — in a diseased tooth or stump, or a partially separated external branch of the opthalmic trunk of the fifth nerve. In all such cases, as well as in the other forms, states, and associations, of the fifth, sixth, seventh, and eighth species, which have been enumerated, the treatment must vary in each, and be directed according to the very numerous pathological conditions, which the well-informed pathologist will detect, either as their efficient causes, or as their related effects.

94. Throughout the treatment of this disease, the practitioner should keep the following facts in recollection: — 1st, An appropriate, and hence successful, method of cure should have an intimate relation to both the remote and proximate causes of the disease, and the natural or morbid diathesis of the patient: 2d, It must be directed after a minute inspection of the eyes, and examination into symptoms connected with the head and the digestive viscera: 3d, It must be modified according to the nature of its related, associated, and symptomatic disorders: and, 4th, That much of the success will often depend upon the strict regulation of the patient's digestive and organic functions; upon diet and regimen; and upon a regulated exercise both of the organ of sight and of the body, with a pure and temperate air. Keeping these indications in recollection, the practitioner will modify and adapt the treatment to the presumed nature, seat, complication, and relations of the disease.

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AMENORRHŒA. See Menstruation.

AMNIOS. See Dropsy of the Amnion.

ANÆMIA. See Blood, *Deficiency of.*

ANÆSTHESIA. See Sensations, *Morbid States of.*

ANASARCA. See Dropsy of the Cellular Membrane.

ANEURISM. See Aorta, *Aneurism of;* and Arteries, *Morbid Structures of.*

ANGINA. See Croup. Fauces, *Inflammations of.* Larynx, *Inflammations of.* Pharynx, *Inflammations of.* Throat, *Inflammations of.*

ANGINA PECTORIS. Syn. *Cardiogmus Cordis Sinistri*, Sauvages. *Angina Pectoris*, Heberden. *Asthma Arthriticum*, Schmidt. *Diaphragmatic Gout*, Burton. *Asthma Dolorificum*, Darwin. *Syncope Anginosa*, Parry. *Angor Pectoris*, J. Frank. *Asthma Convulsivum*, Elsner. *Pnigophobia*, Swediaur. *Sternodynia Syncopalis*, Sluis. *Asthenia Pectoralis*, Young. *Stenocardia*, Brera. *Asthma Spastico-Arthriticum*, Stoeller. *Sternalgia*, Baumes and Good. *L'Angine de Poitrine*, Fr. *Brustbräune*, *Herzklemme*, *Brustklemme*, Ger. *Angina di Petto*, Ital. *Suffocative Breastpang*, Eng.

Classif. 2. *Class*, Diseases of the Respiratory Function; 2. *Order*, Affecting the Lungs, their Membranes, or motive Power (*Good*). II. Class, I. Order (*Author*, see *Preface*).

1. Defin. *Acute constrictory pain at the lower part of the sternum, inclining to the left side, and extending to the arm, accompanied with great anxiety, difficulty of breathing, tendency to syncope, and feeling of approaching dissolution.*

2. This affection was not recognised as a distinct disease by medical authors, until Dr. Heberden described it as such in the Medical Transactions of the London College of Physicians (vols. ii. and iii.); but the works of Morgagni and Hoffmann show that they were not unacquainted with it in practice. It was also noticed by Poter (*Opera*, No. 22. p. 302.), under the head "Respirandi difficultas, quæ per intervalla deambulantibus incidit;" and he remarks respecting it, that the attacks were sometimes so severe that persons had been suddenly carried off by them. Obscure notices of affections, which probably were of this nature in some instances, may also be detected in authors from Hippocrates downwards. From amongst these, the reader may refer to Aretæus (*Opera*, p. 7. Oxon. 1723.), Cœlius Aurelianus (lib. ii. c. i. p. 348.), Barteletti (*Methodus in Dyspnœam*, Bon. 1632.), and others, adduced by Zechinelli (*Sulla Angina di Petto*, Pad. 1813.), who supposes that the case of Seneca (*Opera*, t. ii. p. 136.), which he has himself described by the term *suspirium*, was actually this malady. Dr. Cullen has passed Angina Pectoris over in his work; but it has been well described by Drs. Fothergill, Wall, Duncan, Butter, Percival, Darwin, Macbride, Hamilton, Macqueen, Johnstone, Haygarth, Parry, Nicholl, and Good, in this country; and by Jurine, Brera, Lentin, Desportes, Kreysig, Ritter, Zechinelli, and Stoeller, on the Continent; and by Dr. Chapman in America.

3. Pathology.—I. Symptoms. An attack of this disease is often preceded by considerable derangement of the digestive organs, especially by flatulence, acid or acrid eructations, or other symptoms of indigestion, with torpid bowels, pains in the limbs, and occasional spasms about the chest: but it frequently also attacks a patient, particularly when walking or ascending an eminence, without any, or with but slight, premonition.

4. *A.* In its *acute form*, the patient is seized with a sense of painful constriction of the chest, particularly at the cardiac region, about the lower part of the sternum, inclining to the left, and extending to the left, occasionally also to the right, arm—at first, no further than the insertion of the deltoid muscle; but the pain often successively reaches to the elbows, wrists, and sometimes even to the fingers. This is the mildest form of the disease, and soon subsides with the disappearance of its exciting cause.

5. In the more violent form of the attack, the pain and sense of constriction in the chest, and pain in the left arm, which also frequently extends to the right, amount to excruciating agony; being likened, by Laennec, to the piercing of nails or the laceration by the claws of animals. This feeling is accompanied by a sense of syncope or suffocation, sometimes with suffocative orthopnœa, convulsive dyspnœa, and palpitations; always with extreme anxiety, and a sense of approaching dissolution. The suffocative sensation is characterised by concomitant tightness and fulness of the chest, and flatulent distension of the stomach, and irritative feeling in this organ, which is relieved by eructations. During this period the pulse is variously affected, sometimes little changed, at other times extremely weak, irregular, or intermittent; and occasionally it is full, active and bounding. If the attack has been induced by walking or exercise, the patient suddenly stands still, from a feeling that perseverance in either would produce a total suspension of living power. In the slighter attacks, or early in the disease, rest merely will often immediately remove it; but this is seldom the case in the protracted and severe forms in which it frequently occurs.

6. The paroxysm continues from a few minutes to one or more hours, according to the severity and the duration of the disease. When the malady has assumed a chronic form, and its attacks occur during the night, or when the patient is at rest, the paroxysm is less violent, but generally of much longer duration; whereas, when it is induced by exertion, &c. it is of extreme violence, but of short continuance: the average duration of the fit may be about half an hour. Upon its cessation the patient merely retains a slight feeling of the various symptoms, with numbness of the arms, particularly the left. When the disease is of short standing, the paroxysms occur at long intervals, which are gradually shortened, until there is but little exemption from them, and the affection assumes a less acute character.

7. *B.* The *chronic* form of the disease is characterised by the circumstance of its being frequently a consequence of the acute; by the occurrence of the fit from the slightest causes, and after short or imperfect intervals of exemption; by its recurrence when the patient is at rest, or asleep; and by its much longer duration, but less extreme violence. Even if this form be induced by exercise, rest has little influence in shortening its duration, as in the preceding; and the paroxysm has been protracted not only for some hours, but even for several days. Palpitation of the heart, irregular and intermitting pulse, are more frequently concomitants of this state of the disease, than of the other. In the case of a very eminent and learned member of the profession, whom I long attended in this form of the disease, the attack has often continued as now described, with little remission for several weeks. Sometimes the irregularity of the pulse is observed only during the paroxysm; but in some cases it is continued, as Dr. Fothergill has correctly remarked, during the intervals, particularly when they are marked by imperfect relief.

8. This form of the disease may also occur primarily. It has twice presented istelf to me in this manner. During the severity of the attack, leipothymia, a feeling of dissolution from the intense agony, and these followed by palpitations, and an irregular state of the pulse, generally occur. In some cases the agonizing pain extends not only to the arm or arms, but ascends also up the throat and lower jaw, accompanied with a severe sensation of spastic constriction. In the majority of cases the above sensations are only present, when excited by motion, by assuming suddenly the erect posture, or even by attempting to read; a neuralgic kind of pain generally, however, being felt under the sternum, and extending to the arms: but in some cases, and in two which occurred to me, the exacerbations were often referrible to no very evident cause, they sometimes occurring during the night, although the above causes generally induced them.

9. Notwithstanding the remarkable distress characterising the paroxysm, this disease, particularly in its acute state, sometimes does not early affect the constitution, or entail any permanent lesion; the patient often enjoying tolerable health in the intermissions, and performing all his functions naturally, and without embarrassment, until shortly before an attack. After its protracted continuance, however, the vital energies of the frame, particularly as they are manifested in the digestive and circulating organs, give way. Marked disorder of the chylopoietic viscera, attended with various dyspeptic symptoms, occasionally with great irritability of the stomach and bowels, impeded respiration, anxious and pale countenance; flabby state of the integuments and muscles; marked derangement of the circulation, œdema, dropsy, &c.; at last supervene. But it more generally happens that the patient is carried suddenly off by a paroxysm before this state of the system is occasioned; or he sinks under the complicated derangement proceeding from an attack, and from some one of the organic changes which the continuance and repeated fits of the disease had induced.

10. II. Causes.—1. *Predisposing.* This disease usually attacks the middle aged, and those beyond it; and men much more frequently than women. Of nearly one hundred cases, about seventy were upwards of fifty years of age; and seventy-nine out of the number were males; nearly one half terminated fatally, and almost the whole of them suddenly. It has been said also to occur more commonly in robust and corpulent persons with short necks. But Jurine and Chapman dispute this. My own experience agrees with theirs in respect of its being equally common in persons of a spare as of a full habit. It is most prevalent in those of gouty and rheumatic diathesis, and who lead an indolent, or studious and sedentary life, or who have been subjected to much and continued anxiety and distress of mind, or indulged in much food, and spirituous or other

liquors. JURINE and PARR state that they have scarcely met with it under fifty years of age. The most violent and distinctly marked case of it which ever came before me, occurred in a gentleman at the age of thirty-four. During 1821, I attended an unmarried lady, aged twenty-six, who laboured under it in a slighter form; and recently, in 1830, another single female, at the age of twenty-five, came under my care, with the disease in its most violent grade. In both these females, it seemed perfectly unconnected with uterine disturbance, menstruation being regular, and no tendency to hysteria having at any time evinced itself, or could be detected, my attention having been directed to this point. They both ultimately recovered after a long treatment, and the employment of very decided measures. Nearly all the cases which have come under my observation were more or less referrible to mental causes, particularly to disappointment, anxiety, and other depressing passions. Dr. HAMILTON conceives that there is an hereditary disposition to the affection. If we consider it to be of gouty origin, as contended for by BUTTER, MACQUEEN, RITTER, STOELLER, THILENIUS, ELSNER, and CHAPMAN, an hereditary disposition may be also conceded. But, although very satisfactory proofs have been adduced by these authors, and particularly by Dr. CHAPMAN, in an able paper he has recently published on this disease (*American Journ. of Med. Sciences,* No. xiii. p. 67.), yet it does not seem always to depend upon gout. Of the four cases which occurred to Dr. BLACK, of Newry, one only was subject to gout (*Med. Chir. Trans.* vol. vii.).

11. 2d, The *disease is usually excited* by walking, especially walking against the wind, or up hill; by ascending a flight of stairs, or any acclivity, particularly when the stomach is full or distended by flatus. It is also readily induced by either the exciting or the depressing passions, and by whatever perturbates the mind, or occasions emotion. It may also be induced by the most trifling causes, in some susceptible and irritable habits, as by gentle walking, coughing, speaking, or reading aloud; by suddenly assuming the erect posture; by straining at stool; or even by a meal, however moderate, &c. It may also occur in a state of absolute repose, particularly when the disease has become chronic; and the patient may be roused from sleep by an attack.

12. I have seen it occasioned by rapid changes of temperature, particularly by a rapid change to great cold; but different persons seem differently affected by extreme states of atmospheric temperature. In some slight cases the fit has been shortened, by the patient struggling to overcome it, by frequently attempting to make a full inspiration; but this has also failed. The patient is incapable of making this attempt in the more severe paroxysms.

13. III. DIAGNOSIS.—Angina pectoris is more liable to be confounded with asthma, than with any other disease. But a close attention to the phenomena attending upon both affections, will readily disclose a very great difference between them. The paroxysms of asthma always come on during the night, or at the close of the day: they are characterised by a heavy dyspnœa, wheezing, and cough; are relieved by expectoration and exposure to fresh air, and subside gradually towards morning. They are not excited in the same way, nor by similar causes, nor marked by the acute and peculiar pain in the sternum and left arm, which is distinctive of angina pectoris. The stethoscope and percussion furnish us with no signs peculiar to the disease under consideration, unless it be complicated, as is sometimes the case, with organic lesion of the heart and lungs, or with effusion of fluid within the cavity of the pleura or pericardium, when they materially assist us in ascertaining the nature of the complication; and they also serve, by enabling us to ascertain other affections of the heart, to distinguish between it and them.

14. IV. PROGNOSIS.—In recent cases, of no very violent character, recovery will frequently take place under judicious management. But when the disease has become inveterate from neglect, or from being associated with, or from having given rise to, organic lesion, and when it has appeared in a decayed constitution, or has been preceded by other diseases of the heart or lungs, an unfavourable result should be apprehended sooner or later to take place: but the period of its occurrence is uncertain; and the event is generally sudden — sometimes like an electric shock; the movements of the heart being instantly arrested. This issue is often occasioned by a full meal, or by exercise or mental emotions; but it also occurs in old or chronic cases, when the patient is at rest, and apparently uninfluenced by any circumstance or occurrence. When it is followed by symptoms of effusion of fluid within the thorax, or œdema of the extremities, a fatal termination is seldom far distant.

15. V. PROXIMATE CAUSE, &c. Notwithstanding the number of examinations which have been made after death from this disease, but little light has been thrown upon it. This is not so much owing to the absence of morbid appearances, as to the extreme diversity of those which have been observed. Like epilepsy, or dyspnœa, it has presented almost every lesion, to which the organs which it affects are liable. Many of these may be viewed as accidental concomitants, or as concurrent causes; and not infrequently as results of the repeated functional disturbance occurring during repeated attacks. In several instances, not the slightest morbid appearance could be detected: but more frequently the heart and the large vessels in its vicinity have presented marks of disease, generally varied in its nature, and opposite as to its characters. The most common of these are ossification of the coronary arteries; ossification of the valves of the heart, or of the arterial trunks; enlargement of some of the cavities of the heart, either with diminished or increased thickness of their parietes; but most frequently with softening, paleness, and tenuity of the muscular structure of the organ; varicose dilatation of the coronary veins (BRERA); depositions of adipose matter, to the extent of impeding its functions; effusions of serum, blood, &c. into the pericardium or cavity of the pleura, &c. (FOTHERGILL, BLACK, &c.) It has justly been remarked, by my friend Dr. UWINS, " that there is scarcely any malformation of the heart, or its blood-vessels, that has not been occasionally found after death, from what would be considered angina pectoris: while, on the other hand, individuals have fallen victims to the affection, fully marked, and the most accu-

rate post mortem examination has not been able to detect the slightest indication of structural derangement." (*Compend. of Theoret. and Pract. Med.*) In some cases, the only morbid appearances observed have been in other, and distant organs, from that which seems to be, if not the chief seat of the disease, at least the organ chiefly affected in its functions by it—the heart and large vessels having been altogether exempt from lesion. These appearances were adhesions of the serous surface of the lungs to adjoining parts; serous effusions into the pleura; thickening of the respiratory mucous surface; dilatation of the bronchi; œdema of the intervesicular cellular tissue of the lungs; abscess and tumours in the mediastinum; ossification of the cartilages of the ribs (WICHMANN, JAHN); tubercles, enlargement, scirrhosity, &c. of the liver (PERCIVAL, LATHAM, BRERA, and WALKER); scirrhus of the pylorus, &c.

16. These lesions serve less to throw light on the precise nature of the disease than an attentive examination of the morbid phenomena during the life of the patient, and a calm appreciation of their relations, particularly with respect to the agents tending to diminish, remove, or to exasperate them. This affection has been considered by many authors as spasmodic, "although the part immediately concerned seems not to have been designated or understood." Dr. CHAPMAN remarks, that this hypothesis is rendered probable, by the general complexion of the disease—its causes, symptoms, and cure—and by its analogy to other disorders confessedly of this character.

17. Dr. FOTHERGILL supposed it to be occasioned by obesity, and particularly by a collection of fat about the heart; he also considered that it was sometimes symptomatic of water in the pericardium or cavity of the thorax. PARRY, JENNER, BURNS, KREYSIG, BOSTOCK, and some others, have viewed this affection as a species of syncope occasioned by the accumulation of blood in the heart, from an ossification of the coronary arteries. Drs. HOSACK and FORBES conceive that it most frequently arises from a plethoric state of the blood vessels, more especially from a disproportionate accumulation of blood in the heart and large vessels. To the first and second of these opinions it may be objected, that there is no obvious connection between the effect and the cause; for, as the cause is permanent, the effect should be continued, or at least present but little abatement, whereas the intermissions between the paroxysms are often characterised by a return of the healthy functions. It may be further stated, in opposition to this hypothesis, that many fatal cases have occurred in which this particular lesion was not found on dissection. LAENNEC states that he has examined several subjects who had laboured under this disease, and in none of them did he find the coronary arteries ossified. Besides, cases are recorded by MORGAGNI, SENAC, WATSON, CORVISART, ANDRAL, and others, in which ossification of these vessels were not productive, during life, of the sufferings characterising this disease. Indeed the coronary arteries are often found ossified in old persons, who had not complained during life of any affection of the heart, and who certainly never were attacked by this malady. As to the last of the above opinions, viz. that adopted by Dr. HOSACK, Dr. CHAPMAN has very justly observed, "that even allowing the fulness and irregularity of the circulation contended for, which I am by no means disposed to do, as uniform concomitants, these I should take to be rather the effects of previous irritation or excitement, than the cause of the disease. Do we not also know, that such a condition of the vessels can exist without inducing angina pectoris? Were fulness and irregularity in the circulation only required for the production of the disease, instead of a rare, would we not have it as a daily occurrence? The fact, moreover, is, that angina pectoris, though oftener, perhaps, attacking the plethoric, is to be met with, as I have before said, in the feeble and attenuated." I may add to this, that the severest case of the disease which has ever occurred to me was that of a gentleman who had suffered severely from repeated and profuse hæmoptysis, and other symptoms of disease of the lungs. All these disappeared, but were followed, after some time, by angina pectoris. He was feeble and attenuated; but it was considered advisable to try the effect of blood-letting to a moderate extent: this gave no relief; it was repeated, but the symptoms were evidently aggravated by the measure.

18. Dr. JURINE considers the disease as a nervous affection; and he supports this opinion by referring to the sudden and unexpected manner of its attack—to its sudden termination in death, or restoration to health—the nature of the exciting causes of the paroxysm—the equality and regularity of the pulse, in the majority of cases, during the paroxysm—to the state of the respiration—to the painful sensation extending to the upper extremities—and lastly, to the circumstance of antispasmodics being beneficial in its treatment. The proximate cause, he adds, consists of an affection of the pulmonary nerves, disturbing the functions of the lungs, impairing the decarbonisation of the blood, and producing the pain in the sternum. This affection of the pulmonary nerves is communicated to the cardiac plexus, and deranges, secondarily, the heart and large vessels. The imperfect decarbonisation of the blood diminishes its stimulating influence on the heart and lungs, giving rise to repeated attacks, until it occasions the death of those organs, and then of the brain.

19. MM. DESPORTES and LAENNEC have adopted a nearly similar view of the disease, with this difference, that they consider its particular seat may vary according to circumstances. Thus, M. LAENNEC states, that when there exists, simultaneously, pain in the heart and lungs, we may presume that the affection is seated chiefly in the pneumo-gastric nerves; but where there is simply stricture of the heart, without pulmonary pain or difficulty of breathing, its site is in the nerves which the heart receives from the great sympathetic. But he supposes that other nerves may also be implicated at the same time, either by direct anastomosis or by sympathy; and that the branches of the bronchial plexus, particularly the cubital, are nearly always so affected. "The anterior thoracic originating in the superficial cervical plexus are, moreover, frequently implicated; and this is sometimes further the case with the branches derived from the lumbar and sacral plexuses, when the thigh and leg participate in the attack, which occasionally happens."

20. **Brera, Zechinelli, Averardi**, and some others, consider the disease to be occasioned by pressure of enlarged abdominal viscera on the heart, particularly of enlarged liver. **Joseph Frank** conceives it to proceed from congestion of the cavities of the heart, occasioned by defective nourishment of its muscular structure; this defective nutrition itself resulting from previous inflammation, or from metastasis of gout or rheumatism, or from disease of the coronary arteries. (*Prax. Med. Univ. Precep.*, t. ii. p. 260.) Respecting these, it may only be added, that the symptoms of angina pectoris are very seldom associated with enlargement of the abdominal viscera; and that, although they are much more frequently connected with the lesions alluded to by **Frank**, this connection is by no means uniform, and is obviously not one of cause and effect; these lesions being rather coincident and partial results of the morbid state of the nerves, the altered sensibility of which constitutes one of the chief characteristics of the disease. It may be further stated, that Dr. **Darwin** views it as a particular species of asthma, producing cramp of a peculiar kind in the diaphragm, or the other muscles of respiration; and Dr. **Butter**, while he conceives it to be of gouty origin, also refers it to the respiratory organs, particularly to the diaphragm. On these opinions it is unnecessary to comment.

21. Dr. **Chapman**, to whose valuable paper I have already referred, states, " That the disease is a species of neuralgia, I am entirely persuaded, commencing for the most part in the pneumo-gastric nerve, and spreading in different directions, as other nerves may become involved. The derangement of the heart and other structures, with which it is sometimes associated, I hold to be coincidences or effects, and not the cause; since, among many reasons which might be adduced in corroboration of it, the disease has undoubtedly prevailed independently of such organic lesions, and, conversely, these have existed without occasioning it. But what is the immediate cause of the irritation of the nerves, inducing this neuralgic condition, giving rise to the subsequent phenomena of the disease? This is a question, which hitherto has not been clearly answered. My conviction is, that it is derived from irregular gout, which misplaced, thus operates as an irritant of the nerves, and probably first of those of the stomach."

22. It will be remarked from the foregoing, that **Jurine, Desportes, Laennec**, and **Chapman** agree so far as to impute the disease to a species of neuralgia of the pulmonary and cardiac nerves, affecting the functions of the heart and respiratory organs, and extending by nervous connection to other parts; the organic lesions found in fatal cases being either coincidences, or effects of the disease; and after an attentive examination of the phenomena attendant on several cases of the affection which have come before me, I see no reason for differing materially from this opinion. With regard to the origin of this affection of the nerves in misplaced gout, I cannot so implicitly agree with Dr. **Chapman**. The connection had been previously remarked by several physicians, as I have already stated, particularly by those whose names have been adduced, as well as by **Schmidt** and **Burton**, — a circumstance favourable to the idea that it is founded in truth; and evidence of it may even be found in Dr. **Musgrave**'s very excellent, but now scarcely ever noticed work, on Anomalous Gout. **Wichmann**, however, has disputed this connection, and apparently with much reason. The notice which had been taken of this morbid relation is very candidly referred to by Dr. **Chapman**, who has adduced the particulars of six cases in which this affection was evidently connected with gout, and in which recovery took place, after means had been successfully employed to invite this disease to the extremities. In the majority of those cases the patients had never previously suffered a gouty attack, and yet the means employed were successful in causing it to appear in the lower extremities.

23. But whether this disease is merely a form of misplaced gout, or an affection *sui generis*, which, when occurring in persons of a gouty diathesis, the induction of the regular gouty paroxysm in the extremities generally removes, my experience does not enable me to decide. In two persons whom I was lately called to treat, and with whom I have been long acquainted, I have no reason to suspect a gouty tendency; but the connection so satisfactorily established by Dr. **Chapman** is evidently by no means infrequent, and is one which ought never to be overlooked during the treatment of this most distressing and dangerous disease. I believe that, in addition to the nervous character of the malady, the substance of the heart is often weak, thin, pale, and attenuated, or even softened, as if its substance were imperfectly and unhealthily nourished; and that its cavities, consequently, become occasionally dilated and congested. This view is accordant with the treatment generally found most successful in removing it. In a great proportion of the cases before referred to (§ 10.), of which I had made notes, chiefly collected from authors, dissection had been made in about fifty of those which were fatal; and out of this number nearly forty presented some degree of disease of the heart or large vessels; — most frequently ossification of the valves, coronary arteries, and aorta; and softening and emaciation of the heart. But whether these lesions were rather the consequence than the cause of the disease may be disputed.

24. VI. The **Treatment** of this disease necessarily respects, 1st, the measures which may be adopted during the paroxysm; and, 2d, those which should be resorted to in the intervals, with the view of effecting a perfect cure.

25. 1st, *In respect of the means which may be employed during the fit, with the view of diminishing its duration and violence*, no very precise or dogmatic direction ought to be given. Much will depend upon the peculiar characters of the case. The patient should always be placed in a state of tranquillity; and, particularly, if the countenance be pale, and the carotids pulsating feebly, in the supine or reclining position. The propriety of *bleeding* in the fit has been discussed by several physicians, and depends entirely upon the particular features of the attack. Where the symptoms are urgent, the patient plethoric or vigorous, or the pulse full and possessed of tone, there can be no doubt as to the propriety of the measure. Dr. **Read** (*Dub. Med. Trans.*, vol. i. p. 105.) has recorded a case which well illustrates the good effects of this treatment during the paroxysm. In more questionable cases, where the pulse is weak,

and the countenance is collapsed, bleeding from the arm ought not to be had recourse to. It is doubtful whether or not cupping even should be employed; but where this latter state is not extreme, and especially in cases of intermediate grades of severity, cupping between the shoulders, to a small or moderate extent, as the case may seem to require, will generally afford relief, particularly if used simultaneously with derivatives to the extremities.

26. But in nearly all cases, and still more particularly in those characterised by syncope, and an imperfect action of the heart, *frictions* with stimulating and irritating substances ought to be previously employed over the anterior parts of the thorax, and *stimulants* and *antispasmodics* exhibited internally. As to the extent and repetition of the blood-letting, whether general or local, the practitioner ought to be able to decide, being guided in this, as in other remedial means, by the apparent energies of the constitution, and the state of the vascular system; if these admit, and especially if signs of plethora, or of congestion of the cavities of the heart and large vessels of the chest, exist, the depletion may be carried to a considerable extent, or repeated, according to the relief obtained. The object here is to reduce the body to be moved to a nearer relation to the state of the moving power, at the same time that we endeavour to increase the energy of the latter.

27. I should add, that the propriety of bleeding, in the paroxysm particularly, has been much disputed; and especially by Continental authors. Where the pulse is feeble and soft, and the action of the heart weak, it is generally inadmissible; but, wherever we entertain doubts respecting it, the external and internal use of stimulants and antispasmodics, with frictions, should be cautiously premised, and only local depletions adopted; or depletion of every kind should be entirely omitted until after the paroxysm, when either general or local blood-letting, according to the particular circumstances of the case, may be practised with necessary precautions. I have employed moderate blood-letting in three cases, in which the propriety of the measure seemed questionable, the patients being of spare habits of body, and weakened states of system; but every precaution was taken to prevent immediate ill effects from the operation. In one of the three relief was afforded; in another, the advantage was very doubtful; and, in the third, the disease was evidently exasperated by it, although slight benefit seemed to result from it at the time. In one of those cases the serum of the blood had a milky appearance, from the presence of an oily matter, resulting from imperfect assimilation. From this evidence, therefore, I infer, that, where there are no signs of vascular plethora or cardiac congestion, or where the vital energies of the patient are depressed, and we presume the substance of the heart is attenuated and imperfectly nourished, we should be extremely circumspect in having recourse to vascular depletions of any description, and should particularly avoid bleeding from a vein; but, at the same time, we should be equally careful not to administer too active stimulants.

28. Next to the employment of depletion, under the above restrictions, in suitable cases, and with the concomitant means recommended, the bowels may be opened by a *purgative medicine*, combined with some warm *antispasmodic* and *carminative*, as ether, spiritus ammoniæ aromaticus, camphor, musk, castor, spiritus anisi, &c.; and these may be given, at intervals, subsequently. In the slighter attacks, and where the state of the vascular system and constitutional energies render it prudent to withhold depletion, friction, with stimulating liniments over the thorax and epigastrium, (as the following: —

No. 14. ℞ Linimenti Camphoræ Comp., Linim. Ammoniæ fort., āā ℥j.; Tinct. Capsici ʒiij. M.)

the internal administration of antispasmodics, and the exhibition of a purgative medicine, will be sufficient to give some immediate relief. The following will generally fulfil the intention: —

No. 15. ℞ Infus. Valerianæ ʒxj.; Spirit. Ammoniæ Fœtid. ʒss.; Tinct. Castorei ʒss. M. Fiat Haustus bis terve in die capiendus.

No. 16. ℞ Infus. Sennæ Comp. ℥jss.; Tinct. Sennæ ʒij.; Spirit. Ammon. Arom. ʒss.; Tinct. Cardamom Comp. ʒj. M. Fiat Haustus statim sumendus, et repet. si sit occasio.

Or the following: —

No. 17. ℞ Mist. Camphoræ ℥j.; Liq. Ammon. Acet. ʒij.; Spirit. Æther. Sulph. Comp. ʒj.; Tinct. Camphoræ Comp. ʒj.; Syrup. Papaveris ʒj. M.

29. *Emetics* have been spoken favourably of by Dr. Good (*Study of Med.*, t. i. p. 667.). In a case of great severity, in which vomiting occasionally occurred when the paroxysm was excited by taking food into the stomach, I was induced by this symptom to try the effect of an emetic during an attack, but no benefit was derived from it.

30. The employment of *derivatives* to the extremities, particularly the lower, is generally beneficial; and ought not to be omitted in the paroxysm, whether we adopt the opinion as to the gouty origin of the disease or not. *Stimulating pediluvia*, and *sinapisms* or *blisters*, with all the other measures employed under similar circumstances in irregular or misplaced gout, had the effect, in the six cases of the disease published by Dr. Chapman, of inducing the regular gouty paroxysm, and of affording speedy relief. The *affusion of cold water* has been recommended by some authors, but it is a dangerous remedy in this disease. *Cold epithems* to the head have been mentioned by J. Frank (*Prax. Med. Univers.*, part ii. p. 273.), as having been used with advantage; they seem less objectionable. A similar remark may be applied to the tepid affusion on the head.

31. 2d, *The means which may be employed during the intervals or remissions between the paroxysms* are either *general* or *topical*. With respect to the *first* of these, a most studious attention to avoid the exciting causes of the disease must be inculcated. Next to this, all existing disorder of the digestive organs should be attended to and removed; and the diet and regimen of the patient strictly laid down and enforced. As the powers of the digestive organs are generally diminished, and the bowels either costive or irregular, *vegetable bitters*, with an occasional alterative aperient, either given alone, or in combination with an antispasmodic or anodyne, will often prove beneficial. With the view of thus strengthening the digestive organs and removing spasm, Schæffer (*Volkskrankheiten*, Jun. 1807.) recommended vegetable bitters with opium, musk, camphor, or assafœtida, and Elsner prescribed the *muriate of ammonia*

with Hoffmann's anodyne. *Sulphate of zinc*, recommended by Perkins (*Mem. of Med. Soc. of Lond.*, v. iii.), in doses of a grain, with a quarter of a grain of opium, given twice a day, has a similar action: but it generally is necessary to give it more frequently, and to increase the doses. With the same view I have given the *prussic acid*, either simply, or combined with the oxide of zinc, forming a *prussiate of zinc*, and in one case particularly, with greater advantage than from any other means. I have reason to believe that the *prussiate of iron* will prove equally beneficial; but my experience of its effects is too imperfect as yet to allow me to speak decidedly as to its merits in this disease.

32. In a case which occurred to me a year since, I employed the *preparations of iron*, particularly the carbonate, being led to adopt them by the neuralgic characters of the case, and certainly with apparent advantage; but I should add, that local means were also in operation at the same time. Wherever we have reason to suppose that the heart is debilitated, imperfectly nourished, or attenuated, the employment of tonics, particularly bark, and the preparations of iron, either alone or with antispasmodics, is particularly indicated, with strict attention to diet and regimen. *Auscultation* will be found of service, by intimating to us the particular state of the heart, which must in a great measure regulate our practice.

33. In a case of the disease which came under my care in 1824, I prescribed the *nitrate of silver* triturated with a vegetable extract, as recommended by Sementini. This substance was continued in increased doses, until it occasioned an eruption, resembling nettle-rash, on the skin, — an effect noticed by this physician. The relief afforded by it, after this eruption began to appear, was decided. The patient is, at the present time, in the enjoyment of tolerable health. At the period of my prescribing this substance, I conceived that its exhibition in this disease had originated with myself; but I subsequently found that it had been given in two cases of angina pectoris, with advantage, so long ago as thirty years, by Dr. Cappe (*Duncan's Annals of Med.*, vol. iii.).

34. *Arsenic*, in the form of Fowler's solution, had been recommended in this disease by Dr. Alexander (*Med. Comment.*, vol. xv. p. 373.), at a period antecedent to the introduction of the nitrate of silver into practice, as an internal medicine; and subsequently by Sir G. Blane, who gave it with advantage, combined with digitalis and mercury (*Med. Chir. Trans.*, vol. iv. p. 136.).

35. Besides these, preparations of *bark*, and other vegetable tonics, have been recommended, either alone, or in combination with antispasmodics and anodynes. The *hydrosulphuret of ammonia*, in gradually increased doses (from eight drops to thirty) twice or thrice daily. The different preparations of *valerian*, the *cuprum ammoniatum*, and *sulphate of quinine*, have likewise been employed, and occasionally with decided advantage: from the last of these, combined with an anodyne, particularly with opium and camphor, I have observed much benefit to be derived. The following formulæ may be employed.

No. 18. ℞ Infus. Rosar. Co. ℥ xj.; Quininæ Sulph. gr. j.—ij.; Acidi Sulph. Arom. ♏ x.; Spirit. Æther. Sulph. Comp. ʒ j.; Tinct. Opii, ♏ xij. M. Fiat Haustus bis in die capiendus. Or,

No. 19. ℞ Extract. Anthemid. ℈ ij.; Quininæ Sulph. gr. xij.; Massæ Pilul. Galban. Comp. ℈ j.; Camphoræ Subactæ, gr. xv.; Syrup. Papaveris, q. s. Misce benè et divide in Pilulas xxiv., quarum capiat unam ad binas vel tres bis terve quotidiè.

Having derived much advantage from the internal use of the *sub-borate of sodu* in dyspeptic irritability of the alimentary canal, I was induced to employ it in a case of this disease which occurred to me a few years since, in doses of from twenty to thirty grains, given in the decoctum althææ. It produced some relief; but the case was of the greatest severity, and little benefit, at least of a permanent description, was derived from any means which were adopted, excepting from the prussic acid.

36. *Mercurials* have received the sanction of Brera. I have employed them in two cases: at first as an alterative; five grains of blue pill having been directed occasionally at bed-time, and subsequently so as to affect the mouth. In one of these the alterative dose had a beneficial effect upon the state of the stomach and bowels; but this was of short duration. When, however, pushed further, so as to affect the gums, great irritability of the system, fever, restlessness, and increased pain, anxiety, and sinking, were occasioned by it. In the other case, evidently connected with hepatic disorder, the blue pill was also at first given as an alterative, on alternate nights. It affected the gums after a few doses, and afforded relief. It was now pushed with the intention of inducing salivation; and a somewhat violent effect was produced on the mouth, which was relieved upon exciting the salivary glands. Decided advantage was now procured; the bowels were kept open by means of a stomachic aperient, an issue inserted in one of the thighs, and change of air recommended. This patient perfectly recovered.

37. Where plethora exists, *blood-letting* in the intervals will be serviceable, with a light abstemious diet. When the paroxysms are apt to occur during the night, I have found an opiate given at bed-time, as recommended by Dr. Heberden, of great service. In one case of this description I gave the *acetate of morphine*, in the dose of an eighth of a grain, but it occasioned such distressing feelings of sinking, and general depression of the powers of life, that stimulants were required; yet the same patient had experienced relief from opium combined with camphor. On one occasion I tried the effects of *iodine* in the form of the tincture; but although its use was adopted with great caution, seven drops only having been given three times a day, it occasioned an increase of all the symptoms, apparently owing to its irritating effects on the digestive mucous surface, and the idiosyncrasy of the patient. I may here notice the practice recommended by Schlesinger (*Hufeland's Journ.*, vol. i. p. 57.), consisting in the exhibition, every two hours, of the extract of the *lactuca virosa*, in doses of two grains, with half a grain of *digitalis*. What effect may we expect from the use of *colchicum*? Where the disease seems to originate in gout, the colchicum might be tried; but its use would require great circumspection. In my opinion, it should only be given in combination with stimulants, or antispasmodics and tonics, the spiritus colchici ammoniati being the most promising preparation of it in such a case.

38. Although the patient labouring under this

disease is generally incapable of any, excepting the most gentle, exercise; yet this should be taken under favourable circumstances; and change of air, particularly to healthy, dry, and elevated situations, should not be overlooked. It will generally be observed, that persons labouring under the worst form of the disease, incapable even of walking or sitting upright for any time, will bear well, and even be benefited by, rapid travelling in a carriage. This was first evinced to me by the case of a gentleman of great scientific and literary attainments, residing for a time at Paris, where I was called to him in the summer of 1829. He was anxious to return to England, from a dread of dying abroad. He undertook the journey with me, and was better during it than either previously or subsequently. He has since taken long journeys, with similar advantage, but no means which have hitherto been employed have afforded him more than temporary relief.

39. *Secondly*, Much benefit will be often received from *topical* means. Under this head *issues* and *setons* deserve particular notice. They have been employed on the insides of the thighs by Macbride and Darwin. Kreigelstein and Wolff also have observed advantage to be derived from them, when inserted either in this or in other situations. I have resorted to a peculiar form of issue in several cases of this disease, and, upon the whole, with much benefit. In one case, however, it failed of having the least good effect.

40. The *form of issue* to which I allude, and for the knowledge of which I am indebted to my learned friend Dr. Hutchinson, is the bark of mezereon root, deprived of its external cuticle, and, after having been soaked for some time in a little water, placed upon the surface of the part from which we wish to procure a discharge. This bark should be confined to its place by means of adhesive plaster, spread on paper of larger dimensions than the part covered by the mezereon bark. The bark may be renewed every night, until it procures a copious discharge. In some cases the effect is produced in a single night, or in twenty-four hours. When the discharge becomes copious the bark may be renewed less frequently. The adhesive plaster serves both to keep the mezereon in its situation, and to retain the discharge, so as to preserve it from soiling the clothes. When it is abundant the plaster may be renewed, and the secretion removed, as its occasional acrimony often tends to heighten and to extend the irritation. In a severe and chronic case of this disease, which occurred to me lately (in 1830), I employed this form of issue, and kept a surface of about four inches square over the left small ribs discharging as long as the patient would endure this treatment. The disease disappeared, and up to this time it has not returned. The advantages of this issue are, that the patient can manage it from the beginning with great ease; and it may be readily increased to any extent, and the discharge augmented, according to the exigencies of the case.

41. *Artificial eruptions*, from the *tartar emetic* ointment or plaster, have now usurped the place of setons and issues; but, from a very extensive experience of the former, both previous and subsequent to the publication of an article on them in the London Medical Repository for April 1822, I consider them of inferior efficacy in some diseases, and particularly in this, to the pea-issue, or the issue now described. It is singular that the advantages to be derived from the production of artificial pustulation, in the treatment of various disorders, were so little known or appreciated until the appearance of Dr. Jenner's pamphlet on the subject, since the practice had been recommended long previously in the Lectures of the second and third Monros on Morbid Anatomy, as being frequently preferable to the use of blisters; and had been found serviceable by Goodwin, Autenrieth, and Kreigelstein, in this affection, in which it had been employed by them at the end of the last century.

42. *Blisters*, either frequently repeated, or kept discharging for a longer or shorter period, have received the sanction of Percival and many others. But little benefit will be derived from them, unless they be used in the way now named. Thilenius recommends (*Med. und Chir. Bemerkungen*, i. p. 183.) repeated blisters applied between the shoulders. I agree with him in the selection of this place in preference to others for their application, as well as in the propriety of repeating them frequently. M. Laennec states that he has derived great advantage from *magnetism*, used in the following manner, both in alleviating the paroxysm and in preventing its accession: — He applies "two strongly magnetised steel plates, of a line in thickness, of an oval shape, and bent so as to fit the part, — one to the left præcordial region, and the other exactly opposite, on the back, in such a manner that the magnetic current shall traverse the affected part." (*Diseases of the Chest*, p. 705.)

43. When the affection is *complicated* with other diseases, particularly with organic lesions of the heart, or enlargement of the liver, the treatment should be modified accordingly. In order to ascertain the nature of such complications, auscultation may be resorted to; for, although it gives us no information respecting the simple disease, it often enables us to detect the lesions with which it is sometimes associated, and to direct our means of cure more appropriately, and with happier results, than we could otherwise do. When the substance of the heart is weakened or attenuated (§ 23.) tonics, particularly sulphate of quinine, sulphate of zinc, and the various preparations of iron, given in decided doses, are particularly indicated. In other cases, as well as when the liver is affected, issues are generally serviceable. When the disease is connected with enlargement, &c. of the liver, mercury is almost indispensable. In all cases, whether simple or complicated, attention to diet and regimen, a pure air, amusement without excitement, and an equable and contented state of mind, are not only requisite to recovery, but are also necessary to render it permanent.

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ANIMATION, SUSPENDED. See Asphyxy.

ANTIPATHY. Syn. Ἀντιπαθὴς, Gr. *Antipathia*, Lat. *Der Widerwille, die Antipathie*, Ger. *Antipathie*, Fr. *Antipatia, Avversione*, Ital. *Antipathia Sensilis, et A. Insensilis*, Good.

Classif. — 4. *Class*; 4. *Order* (Good). I. Class; IV. Order (*Author*).

1. Defin. *Internal horror and distress on the perception of particular objects, with great restlessness, or with fainting.*

2. This singular affection has merely been mentioned by Cullen: it has, however, received more attention from Sauvages, Linnæus, Vogel, Ploucquet, Passament, and Good. The last named writer has needlessly divided it into two species — *sensile* and *insensile* antipathy; the former arising from objects or subjects which strike some one of the senses; the latter from the presence of an object, as soon as it comes within the sphere of some unknown influence, although unperceived by any of the senses.

3. There are numerous instances of singular antipathy on record; and most persons of observation have met with others in the course of their experience. The vulgar explain them generally by considering that the mother had experienced a fright from the objects of antipathy during the early months of pregnancy — and there are, no doubt, some facts which countenance the supposition. Thus, James the First could not endure the sight of a drawn sword: Rizio was killed at the feet of Queen Mary when pregnant with him; and many other instances are mentioned by writers: but more frequently the persons themselves, who are thus affected, have experienced frights during the early months of infancy, or have had their minds early and indelibly impressed by certain subjects. Peter the Great had a fall from a bridge into the water, when an infant, and he could not afterwards endure to hear the rattling of a carriage passing over a bridge. Persons often retain the antipathy to the sight of crabs, lobsters, &c. which had been occasioned by fright from them in infancy or childhood. A man-servant in the author's family, advanced in life, had so great an antipathy to the sight of a mouse, that he would fly as fast as he was able from the place where one was seen; and become quite frantic at the sight. He stated that his mother, who likewise had an antipathy to mice, had been distressed by one thrown upon her when pregnant of him. Some persons cannot endure certain odours, from the faintness, or sickness, or sense of anxiety and distress they occasion. This appears to proceed from peculiar idiosyncrasy. I have likewise seen persons who could not touch certain smooth objects without feeling a peculiar shudder or horror, followed by faintness in some. This appears to arise from associations excited in susceptible or sensitive minds.

4. The most singular instances of antipathy are those which occur at the presence of objects unperceived by any of the senses; forming the *insensile* antipathy of Dr. Good. Thus, a cat concealed in a room has been known to produce a most indescribable distress or horror in a person who has not perceived it by any one sense, and has been, in no other way, informed of its presence. Some singular idiosyncrasy, doubtless, exists in such cases. Sauvages conceives that an effluvium proceeds from the animal, which, combining with that emanating from the person thus affected, occasions the unpleasant sensations upon his peculiar organisation or idiosyncrasy. This is, perhaps, the only opinion that can be formed on the subject.

5. The Treatment to be adopted for the removal of antipathies consists chiefly of resolute endeavours to overcome the morbid impression, by gradually accustoming the mind to its influence. Indeed, this is the only remedy that can be resorted to. Its adoption, successfully or otherwise, will entirely depend upon the mental energy of the patient. But there cannot be a doubt, that all impressions, however unpleasant or distressing, may be ultimately overcome by repetition, and a firm resolution either to endure, or not to be affected by them. The following works will furnish some curious information on this subject, with much trifling, silly hypothesis, and irrelevant matter: —

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ANUS. See Rectum.

AORTA. Syn. *Arteria Magna. Aorte*, Fr. *Aorta, die grosse Schlagader, Hauptstamm aller Körperpulsardern*, Ger. Its Diseases.

1. This most important vessel is liable to all the lesions which have been noticed under the article Arteries. Some of them, however, when seated in this artery, are so important, particularly as respects their effects upon adjoining viscera, and their extremely dangerous consequences generally, that I propose to give a succinct account of them in this place. In doing this, I shall so far depart from the alphabetical arrangement, in respect of the subordinate heads of the subject, as may be requisite to the consideration of it in strict pathological order. Functional disorder, therefore, of this vessel will be *first* considered; *next*, inflammation; and, *lastly*, those lesions which usually result from inflammation, &c., as aneurism, constriction, obliteration of the vessel, &c.

2. I. Nervous Pulsation of the Abdominal Aorta. II. Class; I. Order. This is not an infrequent affection in weak, emaciated, and delicate persons, and particularly hysterical females. It is often *associated* with collections of air in the colon; and with accumulations of fæcal matters or morbid secretions in the cæcum. It is also not infrequently consequent upon neglected dyspepsia.

3. *A*. The *Symptoms* are generally very characteristic of the nature of the complaint, and sufficiently serve to distinguish it from organic lesion of the vessel. The morbid pulsation is generally associated with nervous or hysterical symptoms, and is of a variable character. It is increased and diminished, sometimes without any evident cause, but more frequently by mental or moral affections and emotions, or by constitutional causes. Disorders of the stomach, and irregularity of the

uterine functions, also sometimes occasion or reproduce it; and I have observed it to follow upon the paroxysms of sinking or leipothymia to which very delicate females are occasionally liable.

4. Upon pressing the stethoscope firmly over the aorta, the pulsation will be generally felt limited in extent, in its transverse or lateral direction, but it will be very perceptible in the course of the vessel from the bifurcation to the epigastrium. Instead of the gradual, steady, and strong motion or impulse attending aneurism, there is felt a vigorous and smart jerk; and the sound is either merely a slight whizzing, or is scarcely to be heard.

5. The *Treatment* of nervous pulsation of the aorta will entirely depend upon the peculiar circumstances of the case in which it occurs. If the paroxysm is severe, the preparations of æther, assafœtida, valerian, and ammonia, should be exhibited. I have seen much benefit afforded by strong coffee and green tea in these cases. The dependence of the affection on mental emotions indicates the propriety of advising a tranquil state of mind, and a mild diet, with attention to the regular functions of the bowels. In cases evincing much irritability, mental or corporeal, hyoscyamus, conium, or the acetate or sulphate of morphine, in very small doses, particularly hyoscyamus combined with camphor, will be found useful. The preparations of morphine, however, should be cautiously administered in this affection. In a case which occurred to me some time ago, the sixteenth part of a grain only of the acetate of morphine was followed by unpleasant depression. Upon the whole, more advantage will accrue from the antispasmodics than from the sedatives just named; but in cases characterised by attendant irritability, the combination of substances belonging to both these classes of remedies will be of great service.

6. In all cases of this affection occurring in females, — and the great majority of them do occur in this sex, — the state of the menstrual discharge should receive the utmost attention. When the more distressing state of the affection subsides, a more tonic regimen and plan of cure may be adopted. The bitter infusions and decoctions, particularly those of calumba, cinchona, cascarilla, and camomile, with the alkaline preparations, &c., and subsequently the preparations of iron, the shower bath, cold salt water bathing, chalybeates, regular exercise in the open air, and light nutritious diet, are the means chiefly to be depended on. When *associated* with other ailments, it is generally symptomatic of them, and therefore in such cases the treatment must be directed to the primary complaint.

7. II. INFLAMMATION OF THE AORTA. *Aortitis. Aortite*, Fr. *Die Aortenentzündung*, Ger. II. CLASS; II. ORDER. Inflammation of the aorta occasionally takes place, but more frequently in a chronic than an acute form, and commonly consecutively of inflammation of the internal surface of the heart, and during the course of certain states of fever. The internal membrane of the vessel is sometimes alone inflamed, particularly when the disease takes place during fevers, or extends to it from the internal surface of the heart's cavities; but, in several cases, the subjacent cellular tissue, or both it and the internal membrane, are chiefly affected. Aortitis seldom originates in the exterior coats of the vessel.

8. The CAUSES of aortitis are, — 1st, External injuries, as blows, contusions, falls, &c.; 2d, Violent, or too long-continued exertion; 3d, The use of hot, stimulating, and acrid ingesta, spirituous liquors, and the introduction, by absorption or otherwise, of irritating poisons and morbid secretions, &c. into the circulation; 4th, The extension of inflammation from the heart, lungs, pleura, and pericardium, and the suppression of the eruption in eruptive fevers; — M. PORTAL states (*Anat. Med.*, t. iii. p. 127.) that he has met with it in cases of this description; — and, 5th, The causes which are productive of diseases of the heart.

9. The SYMPTOMS can scarcely be stated with any hopes of enabling the practitioner to distinguish this disease, which is generally met with in conjunction with other maladies; particularly fevers, and inflammations of the heart, lungs, pericardium, and pleura, and disclosed to us only by *post mortem* examination. *a.* When inflammation more or less *acute* extends along the descending aorta, the patient generally complains of a smarting and painful sensation in the direction of the spine, with a violent feeling of pulsation of the aorta; extending to the iliacs, without any appearance of enlargement or tumour; and unaccompanied by smallness of pulse in the remoter arteries, particularly those of the superior parts and extremities of the body. In the more acute cases, a sensation of heat is felt in the region of the vessel, sometimes with oppressive anxiety, leipothymia, or tendency to fainting, and always increased force and vivacity of the pulsations of the vessel.

10. *b.* The *chronic* states of this disease admit not of recognition until they have produced some one of those organic lesions, which occasion marked obstruction of the circulation, or aneurismal dilatations. Dyspnœa upon slight exertion, emaciation, a pale yellowish tint of countenance, palpitations, hypertrophy and dilatation of the heart's cavities, œdema of the extremities, &c. are then the usual symptoms; and, although they furnish no certain evidence of the existence of this disease, yet when they are present, without the signs of narrowing of, or obstruction in, the orifices of the heart's cavities, and of the origin of the aorta, chronic disease of the aorta may be presumed to exist.

11. The PROGNOSIS of this disease, when its existence is presumed, is always unfavourable; on account both of our ignorance of much that is important respecting its symptoms, complications, and consequences, and of the fatal nature, sooner or later, of a great part of the effects to which it gives rise.

12. Aortitis, particularly in its chronic states, is occasionally *complicated* with hypertrophy of the left ventricle; the hypertrophy either causing the inflammation of the aorta, or the later occasioning the former, particularly when the canal of the vessel is narrowed or obstructed by the effects of the inflammation. The other complications have been already noticed (§ 7—9.). It is chiefly owing to the more frequent occurrence of the disease in a complicated, than in a simple form, that it is so commonly overlooked, and so difficult to be ascertained, even when its existence is suspected.

13. The LESIONS produced by inflammation of the aorta are nearly the same as those I have enumerated in the article on the lesions of arteries.

But as these changes, when affecting this important vessel, are often the first step to the formation of aneurism in it, I shall here briefly allude to them as they actually appear upon examination. *Aortitis*, whether occurring simply, or with disease of the heart or other related viscera, presents the results of various grades of activity. In the more acute cases, the internal surface of the vessel is of a deep or dark red, sometimes approaching to purple; and both the internal membrane and the middle coat are easily torn. The connecting cellular structure and the fibrous coat are much more injected with blood than natural; and coagula, more or less firm, and of a fibrous character, sometimes adhere to the internal surface of the inflamed part: but this is not often observed in the aorta, as the current of the circulation through it seems to wash away the fluid as soon as it is effused, and before it coagulates on the surface which produced it. *Obliteration* of the aorta (see § 53.) may, however, arise either from external pressure, or from false membranes formed in its internal surface, so as to obstruct the current of the circulation in it; or from depositions of lymph between its coats, sufficient to produce the same effect, the obliteration being thus a remote consequence of the obstruction.

14. The results of chronic aortitis, are more frequently met with than those of the acute. These are yellow spots, or yellow curdy matter deposited under the inner membrane, which may burst from the distension and the friability occasioned by the inflammatory state; the curdy matter projecting like a tubercle into the canal of the vessel; bony deposits, which are also just formed under the internal membrane, and in like manner become exposed and washed by the current of the blood in the vessel; thickening and induration of the coats of the aorta; friability and softening of one or more of them; ulceration commencing in the lining membrane, and extending more or less through the exterior tunics, till at last dilatation of the external coats in the form of a pouch, or fatal hæmorrhage, ensues; and cracking, and laceration or dilatation, which, with the former lesions, generally originate the different forms of *aneurism* to which this vessel is liable. (See § 18.)

15. Dilatation of the coats of the aorta may first occur, and then the inner or middle coats give way when it has reached a certain pitch: or the laceration of the inner coats, with or without previous ulceration, may take place previous to the dilatation. But either state of disease — dilatation or laceration — especially the latter, seems to proceed from a nearly similar pre-existing change of the internal tunics, one evidently connected with slow inflammatory action. Even dilatation, which has been attributed to debility of structure, is more frequently a result of inflammation, which in fact occasions here, as it does every where else, debility of structure; defective vital cohesion of the texture being a general result of inflammation.

16. Treatment. Aortitis requires the same treatment as other acute inflammations. General and local blood-letting, perfect repose, both moral and physical, and the rest of the antiphlogistic regimen, are indispensable. The preparations of *digitalis* in order to quiet the heart's action, cooling aperients to remove fæcal accumulations, and counter-irritants to elicit a determination of the fluids to external parts, are amongst the most efficacious means. In resorting to counter-irritation, care should be had not to employ substances calculated to excite general irritation by their use in this way. The tartarised antimonial ointments or liniments (see F. 305. 749.) are the only means of this description; excepting issues, which should be used in this disease.

17. When those symptoms appear which have been stated to result from *chronic* aortitis, or its effects, local depletions, — particularly when signs of congestion of either the heart, lungs, or head, appear — a restricted diet and regimen, perfect repose of body and mind, attention to the abdominal functions, and the use of the tartarised antimonial ointment, or setons or issues, are the chief means that can be called to our aid. Other remedies may, however, be employed, with the view of alleviating or removing the contingent symptoms and ailments that may supervene.

18. III. Aneurism of the Aorta, — *Aorteurysma. die Aortenweitung*, Ger. IV. Class; II. Order, — is a not infrequent consequence of inflammation, particularly of its more chronic forms. The changes in the parietes of the aorta, constituting aneurism of it, are the following: — 1st, *Simple dilatation* of the whole circumference of the vessel; 2d, Dilatation of one side only, in a sacculated form, without rupture of its coats, or *true aneurism*; 3d, Dilatation of the external or cellular coat of the vessel, occasioned by rupture or ulceration of the internal and middle coats, or *consecutive* or *false aneurism*; and, 4th, Ulceration or rupture of the internal coats taking place after their dilatation, and occasioning the still further dilatation of the cellular coat, constituting *mixed* or *compound aneurism*.

19. *A. Simple dilatation* of the whole circumference of the aorta may occur to a greater or less extent along the vessel; it may be limited to a small portion only; or it may occur in several parts, giving the vessel an irregular shape, and forming several oval expansions of it. The second of these is the most common. The dilatation is various in extent: it is frequently as great as twice or thrice the natural calibre of the vessel, or even greater. It is usually more evident in one side than in another, and is attended with some one or more of the organic changes described as consequent upon chronic inflammation of the aorta (see § 13—15., and Arteries, *Pathology of*), particularly thinning and thickening of the coats, thereby resembling passive and active aneurisms of the cavities of the heart. The situations in which this change of diameter of the vessel occurs most frequently, are the ascending portion and arch; but it is not infrequent in the descending aorta. Dilatation of the pulmonary artery is very rare. This simplest form of aneurism, although frequently accompanied with various morbid depositions in the coats of the vessel, never contains laminated coagula, unless the lateral dilatations very nearly approach the state of sacs or pouches, constituting the next variety. In some cases of this form of aortic aneurism, similar changes are also met with in some of the large arterial trunks, as the subclavian, cœliac, and iliac arteries.

20. *B. True aneurism*, or extensive dilatation of a portion of the circumference of the aorta, frequently has a neck of less diameter than the body of the sac. It seems to arise from a loss of elasticity and vital resistance of the portion of the

vessel thus affected, in consequence of chronic inflammation and its effects. Owing to this cause the dilated portion of the vessel often presents many of the lesions described as consecutive of the inflammatory state, particularly reddened spots, minute fissures, atheromatous, cartilaginous, or ossific deposits, &c. This variety most commonly affects the ascending portion and arch of the aorta, and shoots out from its anterior or lateral parts. It often attains a considerable size, being sometimes as large or larger than the fœtal heart, and generally inclines towards the right side of the chest. The dilated coats of the vessel are generally thicker, and but very rarely thinner than natural, unless in parts of the aneurismal pouch. When it arises from the root of the aorta, and the inner and middle coats burst, fatal extravasation takes place within the pericardium; no false aneurism taking place in this situation, owing to this part of the vessel being destitute of the cellular coat. Coagula do not frequently form in true aneurism as long as the current of blood in the sac continues to be not much obstructed; but when, owing to the narrowness of its mouth, or to retardation of the current of circulation in it, a partial stagnation takes place, coagula then form, frequently in an irregular or confused state, but sometimes in regular layers.

21. *C. Aneurism with ulceration of the internal coats, or false aneurism.* This variety arises, 1st, from *rupture* or *fissures* of the internal coats, owing to a loss of their vital cohesion, and to friability consequent upon chronic inflammation, associated with fungous, calcareous, and steatomatous deposits; and is often occasioned by accidents, or violent or sudden extension of the vessel: 2d, from *ulceration* following scrofulous and chronic inflammations, and the detachment of various depositions formed in the internal membrane. Cases have been recorded by Laennec and Guthrie, wherein fissures of the internal coats of the vessel, instead of producing aneurismal dilatation of the external coat, had dissected it from the fibrous tunic along the greater part of the length of the vessel; but such occurrences are very rare. This variety of aneurism cannot be formed at the commencement of the aorta: it is most frequently met with in the descending aorta, and the part opposite to the tumour or sac is generally not in the least dilated. Numerous instances of this variety of aneurism are recorded by modern authors.

22. *D. Mixed* or *compound aneurism.* After all the coats of the vessel have been dilated to a certain extent, forming either simple expansion or true aneurism, but, owing to the less extensible properties of the internal coats, conjoined with the effects of previous or existing inflammatory action, rupture or ulceration of them takes place, the impulse of the current of the circulation dilates still further the yielding cellular coat of the vessel, and a sac or cyst is thus not infrequently formed of this coat surmounting the primary aneurism. In this case the perforated internal coats form the neck of the cyst, which is always narrower than the cyst itself. When the ruptured part of the internal coats is considerable, so that the impulse from the current of blood prevents its coagulation in this cyst; or, when in this, as in the other varieties of aneurism, coagulable lymph is not formed, so as to give rise to layers of fibrinous coagula within the sac calculated to support it, rupture of the sac will sometimes occur, and a diffused form of aneurism be the result.

23. *E. Of certain changes connected with aneurism of the aorta.* In some rare instances an aneurism of this vessel has been observed by Haller, Dubois, Dupuytren, and Laennec, consisting of hernia of the inner coat through the ruptured fibrous coat. But it is obvious that aneurism, or tumours of this description, can seldom reach any considerable size without being either ruptured, owing to the more friable nature of the internal membrane, or confined by granulations and adhesions on its external surface, as shown by the experiments of Hunter, Scarpa, and Home. Solid small tumours, of the size of nuts, and closely attached to the aorta, have been described by Corvisart and Hodgson; the latter of whom supposes, with Laennec and Bertin, that they are the remains of spontaneously cured aneurisms, their sacs having been filled with coagula, and their size afterwards diminished by absorption. The deficiency of the coats of the vessel, at their points of union with it, seems to confirm this opinion.

24. *a.* One of the most important changes connected with this disease is the deposition of fibrine and the formation of coagula on the internal surface of the sac. This process generally appears to proceed by progressive steps; and the deposition thus presents successive layers. The most central of these generally consist of blood only, more or less firmly coagulated; and each layer becomes firmer, drier, and paler, and more and more fibrinous, until the parietes of the sac is reached. In many cases, the most external layers chiefly consist of a whitish or greyish yellow fibrine, more or less opaque and friable. Sometimes they nearly resemble dried paste. The more recently formed coagula are soft, loose, and often only partially adherent to the layer next it. In some cases, blood seems infiltrated between the layers. Those next the vessel are generally united to it by a fine cellular-like tissue, furnishing appearances of a partial organisation. These depositions evidently proceed from the effusion of coagulable lymph from the internal surface of the aneurismal sac, and the partial stagnation or retardation of the blood, favoured by the narrowness of the neck of the sac, and the inflamed, uneven, or rugged state of its internal surface. When neither of these states exists, as is often the case in respect of the first two varieties of the disease, and particularly when the neck of the pouch is wide, neither coagula nor layers of fibrinous deposits are formed. When, however, inflammation of the internal surface of the dilated vessel or of the sac exists, and when a morbid secretion takes place from it, this will originate coagulation of a portion of the blood which comes in contact with it, and form, at the same time, a bond of union between the coagulum and the internal surface of the dilated coats of the vessel. The thickness and compactness of the coagula in aortic aneurisms are often remarkably great, and are chiefly to be imputed to this mode of origin. (See art. Blood.)

25. *b.* As the aneurismal tumour enlarges, it generally occasions important changes both in itself and in adjoining parts. Those which respect the sac itself are chiefly thickening of the

dilated coats, or thinning of them; and, in some instances, of both these changes in the same case. When the extension of the sac is considerable, or when moderate, if opposed by a firm substance, as cartilage or bone, ulceration or absorption of the parietes of the sac, inflammation of its more exterior parts and adhesion to adjoining structures; and, ultimately, as the tumour increases, perforation or rupture of the more prominent part, followed by fatal hæmorrhage, take place. The mode in which the aneurism bursts is different, according to its situation and the structure which it compresses and destroys: thus it not infrequently breaks by ulceration and perforation of a limited part of the sac. In some cases, particularly when it opens into a serous cavity, distinct laceration of the more exterior covering occurs; when it reaches a mucous surface or the skin, a slough is formed on its most prominent part, which is soon detached, and fatal hæmorrhage is the result. In the majority of such cases, the proper coats of the vessel may have been long previously destroyed at one part or other of the sac. But, if the aneurism form at the root of the aorta, rupture or ulceration of the proper coats of the vessel is followed by instant effusion of blood into the pericardium. Rupture of the aneurismal tumour, as respects the coats of the vessel, whether bursting into a hollow cavity or upon a surface, or forming a diffused aneurism, is generally transverse; but it is, in some cases, longitudinal, when it implicates all the coats of the vessel; or the rupture of the internal coats is transverse, and that of the external coat longitudinal; the former being almost universally transverse. The effects of aneurism upon adjoining parts require particular notice.

26. *F. Of the effects of aortal aneurisms on adjoining parts, and the situations in which they break.* The effects of aneurisms on adjoining parts necessarily depend upon their volume, firmness, and position. The heart, lungs, trachea, large bronchi, œsophagus, pulmonary artery, large veins, thoracic duct, and various organs contained in the abdominal cavity, may be displaced, atrophied, or partially destroyed, by the compression occasioned by them.

27. *a.* The vena cava is not infrequently more or less obstructed by the pressure of aortal aneurisms. M. Reynaud (*Journ. Hebdom.* t. ii. p. 109.) met with a case in which this vessel was very nearly obliterated by an aortal aneurism, and M. Bouillaud mentions a case in which the superior vena cava was so much compressed by an aneurism at the arch of the aorta, that apoplexy was caused by it (*Dict. de Méd., et Chir. Prat.*, t. iii. p. 403.); and Corvisart (*Journ. de Méd. par MM. Corvisart,* &c., t. iii. p. 85.) and Bertin, relate similar instances. The thoracic duct has also been destroyed by it, as was observed by M. Laennec. Mr. Hodgson and Sir A. Cooper met with cases in which the common carotid, and subclavian arteries were completely obliterated by the pressure of aortal aneurism.

28. *b.* When the pressure of an aortal aneurism destroys an adjoining viscus or structure, the ulcerative inflammation is often extended from the parietes of the sac to them, followed by the adhesion and absorption or ulceration of the parts most compressed, until the tumour bursts, in one of the modes now stated (§ 25.), into one or other of the following situations: — Aneurism of the ascending or pericardial aorta generally opens into the pericardium: in three cases it bursts into the pulmonary artery, recorded by Dr. Wells (*Trans. of Society for Improvement of Med. and Chirurg. Knowledge,* vol. iii. p. 85.), M. Sue (*Journ. de Méd. Contin.*, t. 24. p. 124.), and MM. Payen and Zeink (*Bul. de Fac. de Méd.*, No. 3. 1819.). Aneurism of the arch of the aorta may break into the trachea, œsophagus, pleural cavity, or into the pericardium. That of the descending aorta generally bursts into the pleura, œsophagus, posterior mediastinum, or into the lungs. Aneurisms of the pectoral aorta most frequently burst into the left pleura; they have, however, been known, but in two instances only, — recorded by M. Laennec and Mr. Chandler, — to open into the spinal canal, having destroyed the bodies of the vertebræ, which are generally more or less injured in cases of aortal aneurism of considerable size. When seated in the ascending aorta, they often destroy the sternum; in both cases causing interstitial absorption of the bone, and often of the parietes of the sac and fibrinous layers of coagula in contact with it, so that the blood washes the bone itself. The cartilages usually resist the pressure of aneurisms, either altogether, or much longer than the bones; and when the periosteum is inflamed by the pressure of the aneurism, an ossific deposit is not infrequently formed around the tumour.

29. *c.* Aneurism of the aorta may, however, destroy life, even without breaking in any of the above directions; either by impeding the action of the heart and displacing it, or by compressing the organs of respiration, or by occasioning congestion, infiltration, and hepatization of the lungs; or by compressing the œsophagus, or injuring some of the thoracic ganglia; or it may destroy or compress the thoracic duct and large veins, as stated above (§ 27.), to a fatal extent.

30. *d.* The bursting of an aneurism of the aorta is not necessarily followed by instant death, as has been shown by MM. Laennec and Manjolin, and very recently by Mr. S. Cooper. In a case read by this very able surgeon, at the Medico-Chirurgical Society, where the aortal aneurism had pointed under the left shoulder-blade, but subsequently broke into the œsophagus, several pounds of blood were discharged by vomiting and stool, yet the patient lived for many months afterwards, and pursued a laborious occupation; a second hæmorrhage at last proving fatal. When the sac of an aortal aneurism bursts, and the blood flows into a cavity or viscus, from which it is readily discharged, death usually is soon produced. But when the opening in the sac is so situated that the blood is effused into the cellular structure, and what was before a true or encysted abscess becomes a diffused one, life may be prolonged for some days or weeks, or even longer. This, however, will depend upon the situation in which the rupture takes place, and the nature of the parts into or upon which the blood is effused. When the sac of an aneurism is ruptured, the laceration is generally in the same axis, or nearly so, with the opening into the sac, owing to the impulse being greatest in this direction, unless a divergence is occasioned by the unyielding nature of the parts in this situation, and by the slight resistance opposed by parts immediately adjoining.

31. *G. Of the causes of aneurism of the aorta.* Diseases of arteries, and consequently aneurism, are much more frequent in men than in women. Mr. HODGSON states, that of sixty-three cases of aneurism, external as well as internal, seen by him, only seven were in females. But the proportion of cases of aortal aneurism met with in females is certainly much larger than this. I have seen three cases of aortal aneurism in females; but I have certainly not seen nearly twenty-four cases in males, which is the proportion here indicated. Syphilis and the use of mercury have been considered predisposing causes of aortal aneurism, but upon no just grounds. I am inclined to believe, with Mr. GUTHRIE, that the habitual use of ardent spirits has a more marked predisposing effect than any other cause with which we are acquainted. A more immediate state of disposition is created in the vessel itself by inflammatory irritation of its parietes, and the consequent diminution of its elasticity and vital cohesion, or power of resistance opposed to the casually augmented impulses of the heart, especially during mental excitement and corporeal exertion. Hypertrophy of the left ventricle, particularly if consequent upon chronic inflammation of the vessel, and influenced by moral and physical causes, will tend to produce dilatation or rupture of the coats of the aorta. The most frequent *exciting causes*, undoubtedly, are excessive mental emotions, and violent exertion, particularly of the trunk of the body, and when suddenly made; but it seems evident that a morbid state of the vessel has existed previously, at least in the majority of such cases.

32. *H. Of the symptoms and diagnosis of aortal aneurism.* These naturally divide themselves into, — 1st, the rational or general signs; and, 2d, those which are detected by auscultation.

a. The *rational symptoms* of aneurism of the the aorta, whilst the tumour still remains concealed in the large cavities, are very equivocal. The effects produced by it also proceed from various other diseases. Those symptoms, even when considered collectively, are extremely fallacious; but when viewed in connection with those which are detected by auscultation, they are very important aids to diagnosis. 1st, Aneurism of the *pectoral aorta* occasions a sense of oppression or infarction in the chest; but this is felt in various diseases of the thoracic viscera. Dissimilarity of the pulse in both wrists is sometimes present; but this is also met with from diseases of the subclavian artery, from tumours pressing upon it, or from an irregularity in the distribution of the brachial or radial arteries. A *purring tremor*, as pointed out by CORVISART, is sometimes perceptible when the hand is placed upon the middle and upper part of the sternum: when distinctly felt, it indicates aneurism of the ascending aorta: it is also felt above the clavicles in aneurism of the arch, and is one of the surest symptoms of the first and second varieties of the disease; but it is often indistinct when the aneurism is sacculated and contains layers of coagula. This tremor, however, sometimes proceeds from other causes than aneurism, more particularly from the mucous rattle seated in the large bronchi; but, in this case, the purring tremor is not so constant or continued as in aneurism.

33. Pressure from this disease on the trachea and large bronchi occasions a wheezing or sibillous respiration, which is generally permanent, referable to the lowest part of the throat, and sometimes with a whispering or croaking voice; the breathing is also anxious and laborious. Pressure of the tumour on the œsophagus renders deglutition of solids difficult and acutely painful or lancinating, and sometimes even impracticable. But these effects upon the function of respiration will be produced by various diseases of the larynx, and by frequent accumulations of viscid mucus in the upper part of the trachea. The attentive observer will, however, readily ascertain the existence of these affections. Other tumours may also exist and occasion similar symptoms both of respiration and of deglutition; but, in such cases, the diagnosis is often impossible.

34. When the aneurism has eroded any of the bodies of the vertebra, a gnawing or boring pain is felt in the spine; and, when the tumour affects the brachial plexus of nerves, an aching of the left shoulder, extending to the neck and scapula, with impaired power, formication, and numbness of the arm, is complained of. Rheumatism of the shoulder-joint, or parts adjoining, and severe spinal disease, are often attended with similar sensations; and the symptoms referred to the shoulder and arm are frequently present in pericarditis, organic diseases of the heart, and angina pectoris, from the ramification of branches of nerves from the cardiac ganglia to the brachial plexus.

35. Pulsation felt beneath the sternum, or ribs, at the upper part of the thorax, is amongst the most certain signs of this disease: but we should recollect that it will also be occasioned by any tumour interposed between the thoracic parietes and the aorta, and in contact with the latter; by adhesions of the pericardium to the heart and effusions of fluid into the former, and by considerable enlargement or dilatation of the heart itself. Pulsation above the clavicles, although a frequent symptom of aneurism of the ascending aorta or of its arch, may likewise proceed from other causes, as enlarged glands, or various kinds of tumours, receiving the impulse of the subclavian arteries; from subclavian aneurism, and aneurisms of the innominata and common carotid, between which and aortal aneurism the diagnosis is most difficult, as BURNS, COOPER, MONRO, and HODGSON have pointed out. Violent pulsations of the carotids have been adduced as a sign of aortal aneurism; but they may arise from nervous affection of the heart, hypertrophy of the left ventricle, or from obstruction of the flow of blood in the descending aorta, or in the subclavian arteries.

36. When aneurism of the ascending aorta attains a certain size, a tumour is usually formed about the fifth and sixth ribs of the right side: when seated in the anterior part of the arch, it appears at the third and fourth ribs of the same side, at their sternal extremities: when in the upper part of the arch, the tumour rises above the sternum and sternal ends of the clavicles. When aneurism is seated in the descending thoracic aorta, and in the lower part contained in the thorax, it often points, after destroying the ribs and bodies of the vertebræ, under the left shoulder-blade, and pushes out this part. The strong pulsations always present in the tumour indicate its nature.

Notwithstanding, it may subside, or altogether disappear for a time under an appropriate treatment. Previous to the appearance of the tumour, the symptoms are, as already shown, extremely fallacious.

37. In the advanced stages of aneurism of the thoracic aorta there are generally coughs with mucous or bloody expectoration, dyspnœa, and even orthopnœa, dysphagia, attacks of spasmodic suffocation, pain in the left shoulder, axilla, inner side of the arm, and ascending up the left side of the neck, with pricking pains in the tumour, and sometimes with a sense of whizzing or rushing at the top of, or under the sternum, and occasionally sensible to the hand. A dragging downwards of the larynx is sometimes complained of. All febrile symptoms are generally absent. Although these are the rational symptoms which are most to be depended upon, they must be viewed with those reservations which I have particularised in the preceding paragraphs.

38. 2d, When the aneurism is seated in the *abdominal aorta*, acute pain is complained of in the lumbar region, occasionally shooting into either hypochondria, and downwards into the thighs and scrotum. It is generally constant, but is also sometimes intermittent. It is often exacerbated into violent paroxyms, being dull and fixed in the intervals. It is aggravated by constipation, change of position, or pressure on the loins, and is unattended by any sense of heat in the part. In some cases there is also numbness of the lower limbs, as in that recorded by Mr. Mayo (*Med. Gaz.*, April, 1829), where the aneurism was situated between the crura of the diaphragm and the dorsal pains were excruciating. The patient often complains of severe fits of colic, accompanied with spasm of the abdominal muscles, and occasionally there are nausea and irritation of the stomach, but with little loss of appetite. Constipation is always present. Decubitus on the left side or back often produces great distress, and occasions palpitation, which generally subsides upon turning on the face or right side. Coldness, formication, pricking, and numbness of the lower extremities, are not infrequent; and in some cases paraplegia has occurred, with involuntary evacuations of the urine and fæces.

39. The tumour may not become perceptible externally; but as it increases it will press injuriously upon, and sometimes displace, one or other of the abdominal viscera, particularly the stomach, liver, and even the heart. When the tumour can be detected externally, it has generally been in the left side, nearly on a level with the last dorsal vertebra. When large, it often impedes the action of the diaphragm, and thus deranges the respiration. In some cases it has pressed upon the pericardium, and thus had the double pulsation of the heart communicated to it. (See *Cases* by Drs. Graves and Stokes, *Dub. Hosp. Reports*, vol. v. p. 24.)

40. *b. Signs furnished by auscultation.*— Dulness of sound upon *percussion* of the upper sternal portion of the chest and cartilages of the right ribs, although present in aneurism of the *pectoral aorta*, also occurs in other lesions of the thoracic viscera. Dr. Elliotson states, that a thrilling sensation given to the hand only, or chiefly, when applied *above*, or to the right of the cardiac region, and a bellows-sound heard in the same situation, may justly give a strong suspicion of the disease. But that neither the bellows-sound nor the thrill, always occurs. In four cases out of seven he found both wanting. Laennec never observed the thrill before the tumour became visible externally. He considers that the chief diagnostic of aortal aneurism is a strong and single pulsation, discernible by the ear in the situation of the aneurism, synchronous with the pulse at the wrist, stronger and louder than the action of the ventricles, and unaccompanied by the sound of the auricles. When, however, the aneurism comes in contact with the pericardium, a double instead of a single pulsation of the heart is communicated to the tumour. This was remarked in the cases recorded by M. Cruveilheir, and by Drs. Graves and Stokes.

41. Dr. Hope, in his work, which appeared after this article was prepared for press, observes, that it is unimportant whether the pulsations be *single* or *double*; for, though the latter, they may be distinguished from the beating of the heart by unequivocal criteria, viz.: — " 1st. The *first* aneurismal sound coinciding with the pulse, is invariably louder than the healthy ventricular sound, and, generally, than the most considerable bellows-murmurs of the ventricles. — 2d. On exploring the aneurismal sound from its source towards the region of the heart, it is found to decrease progressively, until it either becomes totally inaudible, or is lost in the predominance of the ventricular sound. Now, if the sound emanated from the heart alone, instead of decreasing it would increase on approximating towards the præcordial region. — 3d. The *second* sound actually does sustain this progressive augmentation on advancing towards the heart; and as its nature and rhythm are found to be precisely similar to those of the ventricular diastole heard in the præcordial region, it is distinctly identified as the diastolic sound.* The second sound, therefore, corroborates rather than invalidates the evidence of aneurism afforded by the first; for, if both sounds proceeded from the heart, both would, on approximating towards it, or receding from, sustain the same progressive changes of intensity." (*Diseases of the Heart and Great Vessels*, p. 425.) Besides these views, with which I concur, the sound of the aneurismal pulsation is deep, hoarse, and of short duration, commencing and terminating abruptly, louder than the loudest bellows-murmurs of the heart, and of a rasping or grating character.

42. The sound of aortal aneurisms is generally audible in the back; and, when the descending aorta is the seat, it is louder in this situation than on the breast. If it presents the abrupt, rasping character, when heard on the back, the evidence of aneurism is complete; for, as Dr. Hope observes, the loudest sounds of the heart, when heard in this situation, are so softened and subdued by the distance as totally to lose their harshness. This is in accordance with the opinion of M. Bertin, who very correctly observes, that when the stethoscope is applied upon the sternum in aneurism of the substernal aorta, and on the back, near the pectoral spine in aneurism of the descending aorta, the disease may be recognised,

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* See art. Auscultation, as to the sounds of this organ.

before any external tumour is seen, by a strong single sound, of greater intensity than that of the heart. The pulsations of aneurismal tumours of large arteries are indeed so intense, hoarse, sharp, and peculiar, as to be readily recognised by a person who has once examined them with the stethoscope, although the sounds they furnish cannot be readily described.

43. The *purring tremor*, already noticed as felt by the hand, may also be ascertained by the aid of the stethoscope. It is chiefly found above the clavicles, in cases of simple dilatation of the ascending aorta and arch and sacculated aneurism in the same situations. In old and large aneurisms, containing layers of coagula, it is generally absent, and is more intense the more unequal and rugged the interior of the diseased portion of vessel, particularly when it is studded with osseous or cretaceous deposits. Dr. Elliotson states, that when the aneurism is large, a single, and more frequently a double, bellows-sound is often heard in the seat of aneurism, distinct from the beating of the heart: when the sound is double, the first is heard along with the pulse, the latter, often the louder of the two, afterwards. The bellows-sound in these cases may be ascribed to the passage of the blood from the dilated aneurism into the narrower commencement of the healthy vessel; and, when the sound is double, the second may proceed from the reaction of the dilated part of the vessel impelling a portion of the blood into the narrow and healthy vessel after the action of the left ventricle.

44. 2d. Aneurism of the *abdominal aorta* is more easily detected by auscultation than aneurism seated within the chest. A constant and powerful pulsation is felt by the hand, and still more remarkably by the ear resting on the stethoscope, accompanied with a brief, loud, and abrupt bellows-sound; but not so hoarse as that of aneurisms in the chest. The pulsation is *single*, unless the tumour comes in contact with the diaphragm and pericardium; and it is either inaudible or very indistinctly heard in the back. By pressing the instrument in various directions, so as to bring it as close as possible to the tumour, its seat and dimensions will be ascertained.

45. Treatment. — The method of cure first recommended by Valsalva has been since very generally adopted, not only in aneurisms of the aorta, but also in similar diseases of arterial trunks. I believe, however, that it has been often carried to a very hurtful length. I have seen cases in which aneurismal tumours had existed for a long time without any increase, as long as the patient avoided any marked vascular excitement, and continued his wonted diet; but when repeated depletions and vegetable or low diet were adopted, great augmentation of the tumour and fatal results soon followed. In three cases which occurred in my own practice, and in which the method I am about to recommend was employed, a marked amendment was the consequence.

46. In order to devise a rational method of treating this formidable lesion we should consider, in the first place, the process adopted by nature to remedy it; and having correctly interpreted this process, we should endeavour to assist nature in accomplishing it. We have seen that aneurismal dilatation, &c. of arteries, particularly of the aorta, (§§ 14, 15.,) commences in slow inflammatory action, and that as the coats dilate or rupture, lymph is thrown out, which coagulates the blood, entangling its fibrine and red globules, and thus a fibrinous coagulum, attached to the inner surface of the vessel, is formed, and by its aid the inflamed and otherwise diseased coats of the vessel are strengthened, particularly as the fibrinous layer of coagulum becomes more and more consolidated or organised. Now, what are the circumstances proper to the circulation and state of the constitution calculated to promote this change on the one hand, or to counteract it on the other; for whatever advances it, or assists nature in its completion, will tend to remedy the disease; whilst whatever counteracts it, will lead to fatal results? I shall first consider the measures calculated to counteract the process which nature adopts to remedy the disease.

47. *a.* I believe that there is no position in pathology more firmly established, since it was insisted upon by John Hunter, than that whatever greatly lowers the vital energies will impede the formation of coagulable lymph and fibrinous coagula, especially in diseased vessels; and that increased rapidity of the circulation, throbbing of the arteries, abstraction of the fibrine and red globules of the blood, by repeated or large depletions, and the absorption of serous, watery, or unassimilated materials into the current of the circulation, in order to supply the place of the portion of blood abstracted, will, with other effects, inevitably tend to prevent those changes from taking place which we wish to bring about. That large depletions produce increased quickness of the pulse, reaction of the heart, throbbing of the arteries, and all the effects now instanced, must be evident to every thinking and experienced observer; and that these effects are actually those which counteract the changes which nature produces, in order to remedy disease of the circulating system, must be equally manifest. That these results will be still further promoted by undue, or too great abstinence, is no less obvious; and yet, how frequently do we find both inordinate depletion and unreasonable abstinence recommended, in the very teeth of their fatal consequences on numerous occasions, for the cure of aneurisms.

48. *b.* But what are the means which are calculated to advance the process which nature uniformly adopts in order to restore as nearly as possible the vessel to a healthy state? These may be stated, in a few words, to be whatever restrains or retards the action of the heart, without reducing the vital energies of the frame, and the preservative influence they exert, both on the coats of the vessel, and on the surrounding structures. Conformably with this view, *strict quietude of body and mind*, a light digestible diet, the careful avoidance of spirituous and malt liquors, and the adoption of moderate general or local depletions, only if the state of the circulation unequivocally requires them, are chiefly to be relied upon; and, as far as my own observation, and the careful study of the cases recorded by various writers have enabled me to judge, they are the only means which deserve any share of confidence. Whilst change of air is generally beneficial, exercise on foot, or on horseback, especially the latter, must be avoided, and the

utmost attention should be always directed to the digestive, secreting, and excreting functions.

49. When, in consequence of the energetic action of the heart, or the plethoric state of the circulation, or excessive action of the tumour, we determine on depletion, it ought to be performed in the recumbent posture; and the quantity as well as the manner of abstracting it should be such as to prevent any risk from too great depression, and its consequent reaction, whether of the heart or of the arteries. When the disease is attended with paroxysms of palpitation, depletion will be seldom of any use, and should therefore be cautiously employed in such cases. *Local depletions* may be resorted to when local pains are complained of; but, if the tumour has nearly reached any of the surfaces, they are seldom productive of benefit.

50. *Digitalis* has been generally recommended; it may be of some service when exhibited cautiously, and in moderate doses, but its full effects must be guarded against. The same remarks apply to *colchicum*. The *superacetate of lead*, combined with the acetic acid, and small doses of opium, is preferable to digitalis; and any hurtful effect that would arise from it will be prevented by an occasional dose of castor oil. In cases attended with palpitation of the heart, or inordinate pulsation of the tumour, I have prescribed the *sulphate of zinc*, and the sulphate of alumina, generally combined with small doses of *camphor* and *hyoscyamus*, with considerable benefit as palliatives. The acetate of lead may also be exhibited in a similar state of combination.

51. The application of *ice* to the tumour has been advised by Continental physicians; but it is often productive of much distress. A lotion, or repeated sponging, and occasionally the continued application of epithems may be employed; morally and physically, with careful prevention of plethora and sur-action of the heart, is indispensible; other means will be useful, chiefly in and either of those recommended in F. 157. 332. 336. may be adopted. Perfect repose, however, as far as they conduce to these states. By endeavouring in this manner to bring about the spontaneous cure of aortal aneurism, it may be supposed that we risk inducing the obliteration of the vessel: but I believe that this is not so likely to occur in the aorta as in smaller arteries; and even were it to occur, the result does not appear so hazardous as the continued increase of the aneurismal tumours; as sufficient evidence is on record of the possibility of a collateral circulation being established.

52. IV. RUPTURE OF ALL THE COATS OF THE AORTA, without aneurismal dilatation of the vessel, is a very rare occurrence, and has been met with only after violent external injuries, such as falls, or leaping from a great height, and from mental excitement, when the vessel has been previously diseased. In the Ephemerides Physico-Medicæ Naturæ Curiosorum (*Dec.* iii. *Ann.* ii. *Obs.* 70.), a case is recorded, in which it was ruptured by a blow on the hypochondrium. Mr. JAMES has recorded an instance of rupture and instant death in an active seaman, previously in good health, from jumping out of his hammock (*Lond. Med. and Phys. Journ.*, vol. xviii.); and Mr. ARNOTT has given a similar case, produced by a violent concussion of the body, from falling from a scaffold (*Ibid.*, vol. lviii. p. 19.). The most instructive case, however, of rupture of the aorta without aneurism has been minutely detailed by Mr. ROSE (*Lond. Med. and Phys. Journ.*, vol. lviii. 4to. p. 15.). In this case, as in the others, the coats of the aorta were all ruptured. They were more readily lacerated than usual, and the inner coat had a thickened stertomatous appearance. A case is given by Dr. HUME (*Glasgow Med. Journ.*, vol. iv. p. 148.), in which rupture of the aorta took place in a strong man upon getting into bed, followed by death in a few hours. An aperture, the size of a quill, was found in the vessel about two inches above its bifurcation. No account is given of the state of its coats.

53. V. CONSTRICTION AND OBLITERATION OF THE AORTA have been observed by several pathologists. STOERCK (*Annales Med. ii.* p. 262.), MECKEL (*Mémoires de Berlin*, 1756), SANDIFORT (*Observat. Anatom. Path. iv.* No. 10.), and Dr. GRAHAM (*Trans. Med. Chir. Soc.*, vol. v. p. 287.), with other recent authors, have recorded cases of extreme constriction of the aorta; whilst M. DESAULT (*Journ. de Chirurg.* 1792), M. BRASDOR (*Recueil Périodique de la Soc. de Med. à Paris*, t. iii. No. 18.), Dr. A. MONRO (*On Aneurisms of the Abd. Aorta*, p. 5.), Dr. GOODISON (*Dub. Hosp. Rep.*, vol. ii. p. 193.), M. VELPEAU, (*Révue Med.*, t. iii. 1825., p. 326.), and M. REYNAUD (*Journ. Hebdom. de Med.*, t. i. p. 161.), have adduced cases wherein this vessel was entirely obliterated, the circulation having been preserved by the anastomosis and enlargement of the arteries sent off above and below the seat of obliteration.

54. With respect to the origin of this lesion, it may be referred primarily to inflammation of the vessel. But various intermediate changes will necessarily have taken place, from the more immediate effects of inflammation to the complete obliteration of the vessel. It is probable that, in some rare instances, as in large arterial trunks, the transverse rupture of the internal membrane of the vessel, with the consequent effusion of lymph, and formation of fibrinous coagula, may so obstruct its canal as to give rise to its partial or total obliteration, without any aneurismal tumour having formed; and it is not improbable that obliteration or constriction of the canal may have proceeded in other cases, from the advanced stages of the spontaneous cure of aneurism; the deposition of fibrinous coagula, and the subsequent changes which had taken place in them, and the diseased coats of the vessel, having ended in obliteration, and the establishment of a collateral circulation.

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APHONIA. See Voice, *Morbid States of*.

APHTHÆ. See Thrush.

APOPLEXY — Doctrine of. Deriv. and Synon. *Apoplexia*, from ἀποπλήσσω, percutio. *Aphonia*, Hip. *Nervorum Resolutio*, Cels. *Morbus Attonitus*, Lommius. *Sideratio*, *Percussio*, Molinar. *Schlagfluss*, Ger. *Apoplexie*, Fr. *Accidente*, *Colpo*, *Gocciola*, Ital. *Apoplexya*, Pol.

Classif. 2. *Class*, Nervous Diseases; 1. *Order*, Comatose Affections (*Cullen*). 4. *Class*, Nervous Maladies; 4. *Order*, Affecting the sensorial Powers (*Good*). IV. Class, III. Order (*Author*, see *Preface*).

1. Nosolog. Defin. *A loss of consciousness, feeling, and voluntary motion; or, in other words, a suspension of the functions of the brain, respiration and circulation being more or less disturbed.*

Path. Defin. *Consists of defective vital energy, with hæmorrhage, or derangement of the vascular system of the brain, and their consequences.*

2. Distinctions. There are few diseases which present a greater variety of modes of attack, or which depend upon a greater number of lesions of the organ affected, than that now under consideration. Its sources, modes of manifestation, and morbid relations are numerous, and many of them difficult of investigation. These circumstances have given rise to various attempts at arranging the phenomena of the disease in such a way as to indicate the relations which subsist between the changes within the head, on which it depends, and the mode and progress of attack. Apoplexy has long been described as consisting of certain forms, which have been distinguished by some authors as the *sanguine* and *serous*, with reference to the nature of the effusion; by others, as the *nervous* and *bilious*, according to their idea of the more immediate causes. By several writers it has been, with more justice, divided into *active* or *sthenic*, and *passive* or *asthenic*; or *entonic* and *atonic*, according to the state of the constitutional or vital powers and respiration, and the degree of vascular action accompanying it. All these arrangements are, however, only partially founded in truth: in many respects they are entirely erroneous. Wherein they are either the one or the other will appear in the sequel. M. Cruvilhier, one of the most recent and best writers on the disease, confines the term Apoplexy to the occurrence of spontaneous hæmorrhage in the brain, and divides it into two species: — 1st, That consisting of a collection of blood in a torn part of the brain, or on its surface, from a ruptured vessel; and, 2d, That with sanguineous infiltration into the softened structure — or capillary exudation into, and combined with, its substance. The defects of this arrangement, as well as of this pathology, particularly in regard to practical purposes, must be apparent; for it will often be impossible to ascertain, during life, whether extravasation of blood has actually taken place, or merely great congestion of the vessels, with or without serous effusion; and many cases of true apoplexy occur occasioning death, as well as where complete recovery takes place, without either of the lesions to which he imputes the disease, having existed.

3. In the account which I will endeavour to give of the disease, its common form of approach and attack will be described; next, the different modes in which the attack is made, distinguishing the principal forms it assumes; and afterwards will be noticed several important states of the malady, arising from peculiar causes and antecedent affections. When detailing the different varieties and states of the disease, it will be made manifest that the distinctions heretofore offered, although occasionally obtaining, have no uniform or even general relation to the lesions existing within the head; that apoplexy, with the symptoms described as characteristic of *serous* effusion, has been frequently found to proceed from sanguineous extravasation; and that the *sanguineous* has sometimes only presented slight serous effusion: a similar objection being also applicable to all the other distinctions above enumerated.

4. Of the Approach, or premonitory Signs, of Apoplexy. The importance of recognising the approach of this disease must be evident to the practical reader; for judicious measures, employed at this period, will often succeed in preventing an attack, or will render it less severe, even when they fail of averting it altogether. The most common precursory symptoms are, a tendency to sleep at unaccustomed periods; a heavier sleep than usual, particularly if accompanied with profound, laborious, or stertorous breathing; stridor of the teeth; nightmare; succussions of the frame, or cramps; a lethargic feeling and drowsiness even during the waking hours; more rarely, unusual wakefulness; pains in different parts of the head, or general headache or megrim; a sense of weight or fulness in the head, or of pulsation of the arteries; incoherent talking, resembling intoxication; a turgid appearance of the veins of the head, particularly of the forehead; lividity or redness of the countenance; slight or imperfect attacks of epistaxis; loss of recollection; irritability of temper, or unusual serenity or apathy of mind; a disposition to shed tears; suffusion of the conjunctiva; collapsed appearance of the alæ nasi; moats floating before the eyes, or dimness of vision (amaurosis); scintillations, or bright or shining coruscations before the eyes during darkness; inability to follow the line in reading; double vision, or a sharper sight than usual; difficulty in shutting or opening the eyes; noises in the ears; dulness of hearing; a sensation of an unusual fœtor; dryness of the nostrils; continued sneezing; frequent yawning; singultus; stammering, or indistinct articulation; the substitution of one word for another, or forgetfulness of words and names; difficulty of swallowing, or fits of coughing upon deglutition; leipothymia, vertigo, or a sensation approaching to faintness; difficulty of writing, or inability to spell the words, or to follow a straight line; torpor, or numbness, or pricking of the extremities; itching, or formication of the surface; pains of the joints or limbs; a feeling of fatigue upon slight exercise; partial or slight paralytic affections, chiefly of the muscles of the face, or

confined to a limb or part of a limb, occasioning drooping of the eyelids, imperfect utterance, slight distortion of the mouth; an unsteady or tremulous gait; tripping upon ascending or descending a stair, or in walking; difficulting in voiding the urine, &c.

5. THE CHARACTERISTIC SYMPTOMS, OR THOSE CONSTITUTING THE ATTACK. After one or more of the foregoing signs, or after the succession of two or more of them, and their continuance for a short or long period, the phenomena which constitute the disease supervene. Sometimes the premonitory signs are so slight, and of so short duration, as to escape notice, the attack being severe and sudden: at other times they are very remarkable, and several of them are grouped together, the attack advancing either gradually and severely, or suddenly, and disappearing rapidly; yet recurring after an indefinite time. The mode of approach and attack sometimes has a close relation to the state of internal lesion; but, occasionally, no such relation can be traced, as will be shown and explained hereafter. The premonitory signs, as well as the early part of the attack, generally present more or less either of *augmented* or *diminished* vascular action, particularly about the head, according to the state of the vital powers. The character of the symptoms, therefore, in respect of degree of vascular action and constitutional power, should receive the utmost attention, as being our best guide to a successful treatment.

6. *A.* In the most *severe and sudden* forms of attack, — the *apoplexia fulminans* of the older authors, and some of the Continental writers of the present day; the *fortissima* of Dr. COOKE and others; the *apoplexie foudroyante* of the French,— the patient is struck down instantly, sometimes froths at the mouth, has a livid countenance, complete relaxation and immobility of the voluntary muscles and limbs, and inconscious evacuation of the urine and fæces; and dies very shortly afterwards, either with or without stertor, or rattle of the respiration, with cold, livid extremities; cold perspiration, and sometimes a cadaverous cast of countenance.

7. *B.* In the more *active* or *sthenic* forms of attack,— the *Apoplexia fortis*; the *entonic* apoplexy of Dr. GOOD; *A. exquisita* of various authors,— the patient is more or less suddenly seized with profound sopor, the eyes being either open or closed; the breathing deep, slow, sonorous, or stertorous; and the pulse slow, full, hard, or strong: sometimes irregular or unequal. In this state of the disease, the above are often the chief symptoms, no signs of paralysis being observed. But frequently the mouth is drawn to one side, the eyes are distorted, and one eyelid immoveable, with relaxation, loss of sensation and of motion of a limb, or of one side of the body; the arm of the non-paralysed side being often closely applied either to the chest or to the genital organs. In this latter state of the disease, there is sometimes also some degree of paralysis of the urinary bladder, or of its sphincter, giving rise to ischuria, or eneuresis, or a combination of both. The patient generally lies on the paralysed side, which is relaxed, incapable of motion, and insensible to the application of irritants; whilst the limbs of the opposite side are sometimes subject to spastic contractions.

8. *C.* In the more gradual seizures, or those of a less complete character, — the *atonic* apoplexy of Dr. GOOD; the *Apoplexia imperfecta*, the *parapoplexia* of various writers, — the patient, after experiencing some of the premonitory symptoms, is seized with alarming vertigo, leipothymia, or feeling of faintness; sickness at stomach and vomiting; disturbance of the senses, particularly of the sense of sight; loss of memory; partial loss of sense, consciousness, speech, and voluntary motion; weak, irregular, and sometimes quick pulse, with more or less of sopor.

9. Besides the foregoing forms of apoplexy,— which differ merely in respect of the state of the constitutional powers, the severity of attack, and the grouping of the symptoms, and not as to the organic lesions which occasion them, — other distinctions offer themselves, which are still more deserving of attention, as generally having a more intimate relation to the changes which are going on within the head, than the degrees of severity of seizure merely. Viewing, therefore the premonitory symptoms as common to all its varieties, I shall divide the disease according to the form, manner, and complication of the attack, and consider, briefly, — 1st, The sudden form of apoplectic seizure, in its simple state, and unassociated with paralysis; 2d, The gradually increasing, or ingravescent attack; 3d, These states of seizure complicated with paralysis; and, 4th, that form which commences with paralysis, and after an indefinite period passes into complete apoplexy.

10. I. SIMPLE AND PRIMARY APOPLEXY. *A. Description.* In this variety of the disease the patient falls down deprived of sense, consciousness and voluntary motion, is like a person in a very deep sleep, with his face much flushed, tumid, and occasionally livid; his breathing slow, deep, and stertorous; his pulse full, natural in frequency, or slower than usual. Sometimes slight convulsions of the limbs, or contractions of the muscles occur, or contractions of the muscles of one side, and relaxation of those of the other. The attack, in rarer instances, is either ushered in or accompanied with general convulsions, passing into complete apoplexy, or profound coma. The patient may continue in this state of profound stupor for several days; or he may recover after some hours, or even minutes, when judicious assistance has been instantly procured.

11. *B.* This form of the disease *terminates*, 1st, in perfect recovery, — often in the course of a few hours, — but rarely when the attack has continued longer than one or two days. I have, however, seen cases of perfect recovery in comparatively young or robust subjects, after the apoplectic state had been of several days' duration. 2d, In death, which may take place in the course of a very few hours, or after some days, but most commonly from the first to the fourth day.

12. *C.* The *appearances* which this class of cases present on dissection may be arranged into — 1st, Those which are insufficient to account for the symptoms, or their termination in death; 2d, Those which proceed from intense injection and congestion of the membranes of the brain, and of the cerebral structures; 3d, Those which are accompanied with an effusion of serum, or engorgement

of the vessels of the head, or both; and, 4th, Those which are attended by extensive extravasation of blood.

13. 1st. Cases of apoplexy in which *no morbid appearance* could be detected after death, have been recorded by WILLIS, STARK, POWEL and ABERCROMBIE; and similar cases have occurred to MORGAGNI, TISSOT, QUARIN, OZANANAM, FODERÉ, and HILDENBRAND. It is to this variety of apoplexy that the term *nervous* has been applied by several eminent authors, particularly by KORTUM, ZULIANI, and HILDENBRAND. NICOLAI referred it to spasm of the meninges; LECAT and WEIKARD to spasm of the nerves and vessels of the brain. BORSIERI termed it *convulsive* apoplexy; and TISSOT and some other authors *hysteric* apoplexy. HILDENBRAND conceives that it is the cause of death in contagious typhus; patients dying after profound coma in this disease, without any effusion or appearance of congestion or compression, but apparently from a sudden collapse of the nervous energy of the brain. Apoplectic seizures, rapidly terminating in death, have been occasionally observed to occur in *epileptics* and maniacs, as recorded by FODERÉ, NACQUART, BELLOC, and GENDRIN, without any manifest lesion of the encephalon. This particular state of the brain seems also, in some instances, to obtain in the course of a few other diseases, and to be occasioned by certain external causes, particularly injuries producing concussion of the brain, lightning, extreme cold, and poisonous substances.

14. A case occurred to me of this description in a man aged about forty, who had complained of vertigo, leipothymia, and loss of recollection, suddenly followed by profound sopor. He had been blooded largely when I saw him. His breathing was not stertorous; his pulse was weak, small, and quick, and his countenance sunk. The brain, on a careful examination, presented no change in colour or consistence, and was even less vascular than usual. The pineal gland was, in my opinion, smaller and softer than natural, and contained scarcely any of the small gritty bodies which are generally found in it. The pituitary gland was not examined, the case having occurred to me a number of years ago, and before my attention had been directed to the nature and functions of this part.

15. 2d. In a large proportion, however, of this class of apoplectic cases, *excessive injection of the vessels* of the pia mater, and *engorgement of the whole vascular system* of the encephalon, are the chief lesions. The pressure to which the brain has been subjected from this cause, as well as the interrupted state of the circulation, whence the attack most probably proceeded, being sufficient to destroy life in a few minutes, or a very few hours at the furthest. This forms the simplest state of sanguineous apoplexy, and is of comparatively rare occurrence. It constitutes the *coup de sang* of the French, and is observed in those cases of *coup de soleil*, or sunstroke, which proves rapidly fatal. I have met with it in two cases of this description.

16. 3d. *Serous effusion* is one of the most frequent appearances found in this form of apoplexy, but it seldom occurs alone, being generally accompanied with engorgement of the veins and sinuses of the brain. It is often also observed in the symptomatic and complicated states of apoplexy which will come under consideration in the sequel. The very judicious observations which have been made by Dr. ABERCROMBIE and M. CRUVEILHEIR, particularly the former, as to the relation which this lesion presents to the apoplectic state, is well deserving of the attention of the pathologist. I perfectly agree with them in considering the distinction proposed between sanguineous and serous apoplexy as not supported by observation; for many of the cases which terminate by serous effusion, exhibit in their early stages all the symptoms usually assigned to sanguineous apoplexy, such as flushed countenance, strong pulse, vigour of constitution, &c.; whilst, on the other hand, many of those accompanied by paleness of the countenance and feebleness of the pulse will be found to be purely sanguineous; even the pre-existence of dropsical effusion, or the leuco-phlegmatic diathesis, or great age, &c. furnish no certain data, although a strong presumption, of the attack being that depending upon the effusion of serum.

17. The serous effusion in those cases in which it constitutes even the chief lesion, cannot be viewed in any other light than in that of a result of pre-existing disturbance of the circulation, depending, as will be more fully alluded to in the sequel, either upon imperfect vital tonicity or action of the vessels, or upon obstructed circulation, especially in the veins and sinuses of the organ, or even upon both. Another circumstance, well deserving of notice, and evincing that the serous effusion is of itself to be viewed as merely a part, and indeed no very important part, of the existing lesions, although the most demonstrable, is the fact also insisted on by Dr. ABERCROMBIE, that the quantity of fluid effused bears no proportion to the degree of the apoplectic symptoms: for we find it in large quantity when the symptoms have been slight; in small quantity when they have been both strongly marked and long continued; and, finally, we find most extensive effusion in the head, where there have been no apoplectic symptoms at all. The inference, therefore, clearly deducible from the most faithfully observed facts, is, that the effusion is not the cause of the apoplectic seizure, but the consequence of that state of circulation on which the disease more immediately depends. Indeed, I am even of opinion that a considerable portion of the effusion takes place either immediately before death, or soon after life is extinct; and that several cases referred to serous effusion have not arisen from this cause, the quantity of serum having evidently not been greater than we have reason to believe naturally exists in the head, as necessary to the regularity of its functions, under the varying states of circulation, and of atmospheric pressure on the surface of the body, from which the unyielding bones of the cranium protect it.

18. 4th. *Extensive extravasation of blood* is a rare occurrence in this form of apoplexy, being most commonly observed in other varieties of the disease. When, however, extravasation is met with, it is either found diffused about the base of the brain, and pressing upon the medulla oblongata, in the fourth ventricle, or in both the lateral ventricles, from rupture of some diseased vessel, or from extravasation of blood near to, with laceration of the cerebral structure at, the surface of

the brain. When extravasation of blood is found, the attack has generally been characterised by symptoms closely approaching those of the next variety, viz. an invading and slight attack, rapidly followed by a short interval of sensibility, which is as quickly followed by profound coma and death.

19. II. The gradually increasing or ingravescent Apoplexy. — *A. Description.* In this form of the disease the patient is not at first seized with loss of sense and voluntary motion; or if he be so seized, the attack is momentary, and passes off without the use of any remedy. It more usually commences with a violent and sudden attack of headach, very frequently accompanied with paleness, sickness, and vomiting. Sometimes the patient sinks down from its severity, pale, faint, and exhausted; and experiences a slight convulsion, but recovers from this state in a short time. This invading and slighter attack generally soon abates, or some of the symptoms subside, and others continue in various degrees or differently modified. The pain is generally referred to one side of the head, and the vomiting sometimes returns. Coldness, paleness, and faintness are complained of, with all the other symptoms indicating a serious shock received by a vital organ. The pulse is weak and frequent, the countenance cadaverous and sunk, and the patient feels depressed, but sensible. After this state has endured from an hour, to two, three, or even more, the surface acquires some heat, and the pulse improves in strength. The face now becomes flushed, and the features expanded. The oppression increases rapidly; he answers questions slowly and heavily, and at last sinks into a state of profound stupor or coma. The period which elapses from the invading attack, to the continued and perfect coma, varies from less than an hour to three days. But Dr. Abercrombie, who has illustrated this form of apoplexy in an able manner, has observed an interval of not more than twenty minutes, and has seen it prolonged to a fortnight.

20. *B.* This is the most fatal form of apoplexy, very few recovering from it. On *inspection after death*, extensive extravasation of blood is always met with. From the whole history of this class of cases, Dr. Abercrombie thinks that they depend upon the rupture of a considerable vessel without any previous derangement of the circulation, the rupture probably arising from disease of the artery at the part which gives way. He conceives, that, at the moment when the rupture occurs, a temporary derangement of the functions of the brain takes place, but that this is soon recovered from; and the circulation then goes on without interruption, until a quantity of blood has been extravasated sufficient to produce coma. This may possibly be the case, particularly in those instances where the coma soon follows the first attack. I am more inclined to think that a depressed or deranged state of the vital energy and circulation of the brain, similar to that which occurs in the foregoing variety of the disease, takes place at the commencement of the seizure, and that the extravasation frequently accompanies the reaction, supervening on the oppression which precedes the perfect attack; or, if extravasation have taken place in the first instance, that it is only to a small amount, the state of energy of the circulation of the organ at the time preventing it from proceeding to any considerable extent, and that it is afterwards renewed in the same situation, or even in a different part, upon the reaction which takes place soon after the shock which the first seizure occasions. Dr. Abercrombie is of opinion, that in some cases the extravasation commences with the early part of the attack, and that it goes on until such a quantity has been accumulated as is sufficient to produce fatal coma; and that in others, after the rupture has taken place, the hæmorrhage is stopped by the formation of a coagulum, and, after a considerable interval, bursts out afresh and is fatal. It is by no means improbable that some cases present the phenomena which this accomplished physician contends for, whilst others may proceed in the manner which I have suggested. A chief reason for my believing that this form of apoplexy frequently originates in the way I have stated, is, that I have met with cases in which the disease was gradual, or consisted of several attacks of either incomplete or complete loss of recollection and voluntary motion, from which the patients had recovered, but had at last been carried off by a more severe seizure; and yet, upon dissection, appearances of recent extravasation merely, or of congestion and engorgement, with or without serous effusion, but without the least extravasation of blood, were the only lesions which existed.

21. The rapidity with which the disease advances, will, of course, depend upon the nature of the lesion, and upon the size of the vessel or vessels from which the hæmorrhage proceeds, and the extent of the extravasation. The situation, also, will have some influence; inasmuch as a small extravasation, if it press upon the medulla oblongata or the annular protuberance, will be more certainly and rapidly fatal than a much larger effusion into the ventricles, or into the substance of the hemispheres.

22. *C.* The *Appearances on Dissection*, chiefly consist of extensive *extravasation of blood*, most commonly in some part of the brain in the vicinity of the ventricles, as the corpora striata, and thalami optici, or some other situation adjoining those cavities, and which frequently lacerates the cerebral structure, and passes into and fills the ventricles. In some instances the hæmorrhage takes place in a part of the brain nearer to its periphery than its internal surfaces: in such cases the blood ruptures the cerebral substance, and is effused on its surface. In the more suddenly fatal cases, this is observed to have occurred generally towards the base of the brain.

23. In cases of profound coma supervening after a considerable time from the first seizure, the parietes of the cavity formed in the substance of the brain by the effused blood, are softened, discoloured, and broken down, evidently indicating that in these cases softening and disorganisation had either preceded the seizure, or speedily followed the first extravasation, and that a recurrence of the hæmorrhage had produced a lacerated opening, communicating either with the ventricles or the exterior surface of the organ. In a considerable proportion of cases of this form of apoplexy, the arteries are either ossified or otherwise diseased. The veins and sinuses also sometimes present morbid appearances (§ 29.).

24. In rarer instances the extravasation of blood takes place in the *cerebellum.* When the effusion is either in this situation or below it, the symptoms are more severe and rapid in their progress than when it is in the substance of the brain. This remark is also applicable when the blood flows from or into the substance of the annular protuberance, or accumulates around the medulla oblongata and foramen magnum. In some of those latter cases, which are much rarer than the foregoing, the fatal result is rapidly produced. In nearly all the cases of extravasation taking place, either within or near the surface of any part of the cerebral structures, it is extremely difficult, if not entirely impossible, to trace its exact source, or the vessel or vessels whence it has proceeded. It is very probable that the laceration produced by hæmorrhage separates several vessels, and thus a greater number are laid open than are concerned primarily in producing the extravasation. Besides, the softening of the surrounding cerebral structure may destroy additional vessels, and give rise to secondary extravasations of blood, either into the original cavity, thus forming a more recent portion or layer of coagulum, or into the surrounding structure in the state of capillary infiltration.

25. Besides the foregoing sources and seats of extravasation, others have been observed. M. SERRES describes a case in which the hæmorrhage had occurred in the substance of the pons varolii, whence the blood had burst into the occipital fossa. It may also take place from the superficial vessels, forming the *meningeal apoplexy* of this writer. In cases of this description, the blood generally seems accumulated between the dura mater and arachnoid; but cases have been recorded, in which the blood appeared to have been discharged from the *retiform plexus* of vessels at the base of the brain, and confined beneath the pia mater. The hæmorrhage may also proceed from *ulceration and rupture of a considerable arterial vessel.* Dr. MILLS met with a case in which it was traced to ulceration and rupture of the basilar artery; and MORGAGNI and SERRES have found it proceed from a similar lesion of the internal carotid. MORGAGNI, DE HAEN, and HUFELAND have traced the extravasation to the vessels of the *choroid plexus.* This is probably the source of the hæmorrhage when it is confined to the ventricles, without laceration of the surrounding substance of the brain. Rupture of one of the *lateral sinuses* has also been observed: a case of this description occurred to Dr. DOUGLAS. (*Edin. Med. Essays and Observ.*, vol. vi.)

26. *Small aneurisms* in various parts of the cerebral vessels may have formed, and by their rupture occasion apoplexy. SERRES relates cases in which aneurism occurred in the basilar artery, and in a small artery in the circle of WILLIS. (*Archives Gén. de Méd.*, t. x. p.419.) Similar cases are also recorded by BLANE and HODGSON. Numerous other instances of extravasation from disease of the cerebral vessels have been noticed by MORGAGNI, LIEUTAUD, DE HAEN, BAILLIE, PORTAL, LALLEMAND; and especially by BOUILLAUD, (*Mém. de la Soc. Méd. d'Emul.* t. ix.), and Dr. BRIGHT (*Medical Reports*, vol. ii. p. 266, *et seq.*), who have adduced several proofs of this kind of lesion. In a case of apoplexy recorded by BANG, the extravasation had taken place between the occipital bone and dura mater. Dr. WATTS, of New York, met with a case in which the hæmorrhage had proceeded from the erosion of a vessel in connection with caries of the inner surface of the parietal bone.

27. *Infiltration* of the blood into, with softening of, the cerebral structure, also seems to form one of the lesions which are sometimes met with in this form of apoplexy, although not nearly so frequently as in the seizures which supervene on, and are accompanied with, paralysis, where this state of softening forms the principal lesion; whereas, when it occurs in this variety, it is one of several other changes, or at least a subordinate one.

28. Perhaps the most common causes of hæmorrhage in this form of apoplexy, particularly when occurring in the substance of the brain, are ossification, earthy deposits in various places, and a peculiar friability, of the vessels of the organ. This state of the vessels, as disposing to aneurism and hæmorrhage, has been well illustrated by SCARPA, and is justly insisted upon as being connected with apoplexy by ABERCROMBIE and CRUVEILHIER, and frequently met with in the brains of elderly persons. "There is much reason to believe," Dr. ABERCROMBIE remarks, "that this diseased condition of the arteries of the brain may give rise to a variety of complaints in the head; and that, after going on for a considerable time in this manner, it may at length be fatal by rupture." The remarkable frequency of osseous or cretaceous deposits, &c. in the arteries of the brain in cases of apoplexy, had been noticed by CORTESIUS and MORGAGNI. There can be no doubt that changes of this description, in connection with alterations of calibre and of vital cohesion taking place in vessels, the coats of which are remarkably thin and fragile even in the healthy state, will readily dispose them to rupture; particularly when influenced by the varying actions of the heart, and the different emotions of the mind, or when congested by derangement of the vital energy bestowed on them by the ganglial system, or by disorder of the veins or sinuses, and interruption to the return of blood through those channels. Indeed, there is every reason to believe that the hæmorrhage may even proceed from the smaller *veins*, in many of the cases where congestion has been concerned in originating it, and especially when the return of blood from the head has been interrupted so as to produce the disease. It may therefore be inferred, that the laceration of the cerebral structure is occasioned by rupture of either an arterial or venous capillary vessel or vessels, and extravasation of blood; and that, in cases of this description at least, the morbid change commences in the vessels, and not in the cerebral tissue itself, the cerebral structure being only consecutively diseased.

29. Cases have also occurred, in which this species of apoplexy has arisen from disease of the *sinuses*, chiefly thickening, induration, and obstruction or obliteration of their canals. When this is the case, the veins running into the sinuses are generally enlarged, tortuous, engorged, and as if varicose. I have met with cases in which all the symptoms of this disease proceeded from the developement of tumours in the central parts of the brain, and similar instances have been recorded by several writers.

30. Besides disease of the *vessels* of the brain, lesions of the *membranes*, as ossific deposits, ossification of the falx (MORGAGNI), but particularly derangements of the circulation in them, especially in the pia mater, — as evinced by copious extravasation on the surface of the hemispheres, or at the base of the encephalon,— and inordinate injection and congestion, deserve to be enumerated among the sources of this variety of apoplexy; although they are, perhaps, more frequently productive of congestion and serous effusion, and consequently of the most common forms of the preceding species. But there can be no doubt that this form, as well as the foregoing, will also sometimes proceed, although much more rarely, from injection and engorgement of the vessels of the membranes and of the brain itself, without extravasation; and that in other instances the degree of congestion, and the accompanying serous effusion, when occurring without extravasation, are not of themselves sufficient to account for the fatal issue, without imputing something to the vital condition of the encephalon itself.

31. III. APOPLEXY COMPLICATED WITH, OR TERMINATING IN, PARALYSIS. — *A. Description.* This form of the disease may take place either suddenly or in the manner of the immediately preceding variety; but more frequently the latter, with the additional phenomenon of paralysis, which may be either coeval with the attack, or supervene as the apoplectic state passes off. In the majority of cases, the patient complains of symptoms referrible to the head, particularly of acute pain in one part of it; and is suddenly or gradually seized with stupor or profound coma, loss of speech and voluntary motion — with perfect apoplexy. The mouth is often distorted, and the patient moves the limbs of one side; whilst one or both limbs of the opposite side are found to be deprived of all motion upon their being pinched or tickled. The patient generally lies on the paralysed side, and one or both the opposite limbs are sometimes contracted or slightly convulsed.

32. In other cases, the seizure is less perfectly apoplectic in its character, varying in the degree of coma and disturbance of the respiration; and, as the seizure declines, the paralytic symptoms become the prominent disease. In some instances of this description, the comatose state is slight or of short duration; but the eyelid, or orbicularis of the eye, of one side is paralysed; or the eyes are distorted, the mouth twisted, and the tongue drawn aside upon its being held out. In the majority of these cases, the speech is either altogether lost or greatly impaired; but the patient appears sensible of his situation, and even attempts to express himself by words or signs: but he is frequently incoherent, unintelligible, and without recollection, even when the power of speech is partially retained. In many of this class of cases, complete hemiplegia exists, or gradually manifests itself as the seizure declines. Sometimes one limb only is affected, which is commonly the arm; although the leg is sometimes the only paralysed part. In rare cases the power of swallowing is lost, owing to paralysis of the muscles of the pharynx and the upper part of the œsophagus.

33. This form of apoplexy presents various modifications in its further progress, which may be arranged under the following heads: —

a. The apoplectic attack may, under judicious treatment, pass off entirely and quickly, and leave no trace of its existence after a short time; the paralytic symptoms, particularly when slight, either disappearing with it, or soon afterwards.

b. The recovery from the apoplectic seizure may be more gradual, taking place only in the course of some days; whilst the paralytic symptoms require several or many months for their removal.

c. The apoplectic seizure may be either quickly or slowly removed; but the paralysis may be permanent, — may continue for years, either until the patient is carried off by a subsequent seizure, or by some other disease.

d. In other cases, the patient experiences a very partial recovery merely, or is subject to several exacerbations; is confined to bed or his room, speechless or paralytic, or the latter only, with his mental faculties either more or less impaired, or but little affected; and at last sinks gradually exhausted, after many weeks, or even months; sometimes having become comatose for a short time before death.

e. The apoplectic seizure may pass off in a shorter or longer time, leaving either hemiplegia, or paralysis of a single limb, or impaired speech and mental faculties; and may recur after a period of indefinite duration, and either carry off the patient, or leave his symptoms greatly aggravated. In this latter case, either another seizure again takes place after a time, or he sinks into the state characterising the immediately preceding modification.

34. *B. The morbid appearances* which this variety of apoplexy, in its different states, presents, are very diversified · — 1st, In some cases, *no lesion* is detected sufficient to account either for the symptoms or the termination; 2d, In other cases, *serous effusion* merely to a slight extent, or little beyond what we have reason to suppose usually exists within the cranium, is found, sometimes conjoined with more or less congestion of the vessels; 3d, In some instances, *congestion* is the most remarkable and only morbid appearance; and, occasionally, this state is connected with disease of the arteries, generally of the kind already described (§ 28.).

35. 4th. *Extravasation of blood* into a defined cavity is amongst the most frequent lesions met with in this form of apoplexy. We have already seen, that, when the hæmorrhage is very considerable, or bursts its way into the ventricles, or to the surface of the brain, the apoplectic seizure is complete; and, owing to the quantity of blood effused, and the pressure thereby occasioned on the whole encephalic mass, the patient is either suddenly carried off before any paralytic symptoms become evident, or rendered comatose, and incapable of sensation and voluntary motion in every limb. In the majority of cases in which extravasation takes place in this form of apoplexy, there is every reason to believe, from its small extent, that it is merely a consequence of the simple apoplectic state occasioned by congestion or interruption to the circulation, — these states of the circulation being followed by the extravasation, on which the paralytic symptoms chiefly depend.

36. 5th. The extravasated blood presents various *appearances*, according to the period which has elapsed from its effusion; and the surrounding

portion of the brain, and parietes of the cavity formed by the coagulum, likewise undergo *changes* — in some cases extremely slight, in others very extensive — which generally have an intimate relation to the various states the patient has presented in the progress of the disease. When the cerebral substance surrounding the extravasated blood continues but little changed, coagula of considerable size are gradually and often completely absorbed. About fifteen or twenty days after the attack, the more fluid part of the effused blood disappears, and the coagulum is firm and of a dark brownish colour. At a remoter period it assumes more of a firm and fibrous texture, and the dark red or brown tint is lost. At last the coagulum is nearly or altogether absorbed; and a small quantity of fibrinous matter, of a slightly reddish colour, which after a time passes into a loose cellular-looking substance, only remains. These changes generally take place at the end of four or five months; but exceptions not infrequently occur. RIOBÉ found blood in the apoplectic cavity after twenty months; MOULIN met with a small coagulum at the end of a year; and SERRES has observed firm coagula at the termination of two and three years.

37. The *parietes of the cavity* also experience an important change. They frequently consist of a firm yellowish membrane; and, when the coagulum is altogether absorbed, this membrane forms a more or less complete cyst and well-defined cavity, which is either empty or contains a little very loose cellular substance connecting its opposite sides in all directions; sometimes with yellowish bands of a denser consistence running through it. Dr. ABERCROMBIE has never found the cavity entirely obliterated; while Dr. BRIGHT, M. CRUVEILHIER, and some other French pathologists, have seen it in some instances, after a remote period, reduced to a dense nucleus; and, in others, to a linear induration resembling a cicatrix (§ 53.). In some cases the cyst has been found distinctly organised, and with blood-vessels ramified in it.

38. The firm membrane constituting the *apoplectic cyst*, or covering the sides of the cavity, seems to form soon after the extravasation has taken place, and apparently arises from the lymph thrown out upon the torn surface of brain. It may generally be detected as early as a fortnight or three weeks after the attack, or even earlier. At a remoter period, when the coagulum is removed, it is either empty, or it contains a serous fluid, usually tinged with blood or the remains of the coagulum. RIOBÉ and other French writers suppose that the serous fluid is exhaled from the membrane covering the cavity, and absorbed after dissolving a portion of the coagulum. When blood is extravasated into the ventricles in cases of this description, although extravasation in this situation much more rarely occurs in this than in the preceding form of the disease, there seems no doubt of the possibility of its absorption. In this case, the membrane lining the ventricle containing the effused blood becomes thickened, and of a yellowish colour. M. RIOBÉ records a case of apoplexy, with palsy of the left side, which was completely removed. The patient died of diseased lungs after eighteen months; and the *right* lateral ventricle contained a small quantity of coagulated blood, and its membrane was changed as now described. Absorption of the coagulum, with the formation of a cyst similar to those formed in the cerebral structure, also takes place when the blood is effused on the surface of the brain, or in the cellular structure of the arachnoid and pia-mater.

39. As the coagulum disappears, the paralytic symptoms in some cases subside; but more frequently the improvement is only partial, and the patient continues paralytic, although the coagulum is either altogether or in a great measure absorbed, and all unusual pressure or interruption to the circulation is removed from the adjoining parts of the brain. It would seem that the fibres of cerebral structure being once ruptured, and not being susceptible of a direct reunion, remain ever afterwards incapable of conveying volition to the paralysed limbs, which are always on the side opposite to the seat of lesion in the encephalon.

40. In some cases of apoplexy complicated with paralysis, the apoplectic symptoms pass away speedily; and the paralysis also disappears, either with the apoplectic attack or very soon afterwards. In these, sufficient time for the absorption of extravasated blood has not elapsed: are we therefore to infer that it has been effused, and recovery taken place notwithstanding? I am more inclined to think that no effusion has occurred in these cases; but that either congestion of vessels in a part of the brain, sufficient to interrupt the functions depending on it, or retardation of the circulation through it, owing to deficient vital energy of the part, occasioning a temporary abolition of its functions, particularly the power of voluntary motion, or both these states, have merely existed. In many cases, one or more coagula, in distinct parts of the brain, or cavities or cysts in older attacks, are found, and generally their number has a relation to the number of seizures. But it occasionally happens that extravasation takes place in two parts of the encephalon, either at the same time or during the same attack; and thus the number of lesions will be greater than of the seizures: and in other cases, particularly in the next form of the disease, the second or even third extravasation takes place in the same situation as the first; forming either an external layer with appearances distinct from the centre coagulum, or a separate portion with the characters of more recently effused blood.

41. 6th. The *substance of the brain* surrounding the extravasated blood often presents important lesions; chiefly consisting of change of consistence and colour. This portion of brain is sometimes very much softened, and is either colourless, or of a yellowish or greenish yellow tint; or presents the usual appearances proceeding from capillary injection or sanguineous infiltration. This change of structure seems to commence from five to ten days after the sanguineous extravasation, and to arise from inflammatory action having taken place in the part surrounding the effused blood. We have already seen that the formation of a membrane around the coagulum, upon the lacerated surface of brain, is necessary to the reparation of the apoplectic effusion; and that the membrane seems formed from lymph thrown out upon this surface. If the local action necessary to the production of

this membrane and to the process of reparation pass the healthy standard, inflammation is the result; occasioning either a considerable effusion of serum or a second hæmorrhage, as already stated, or softening of the surrounding cerebral structure. This consecutive inflammatory action may also give rise to exhalation of serum into the ventricles or into the sub-arachnoid cellular tissue, according to the situation of the primary extravasation; or even, though much more rarely, to a secretion of puriform matter. It sometimes happens, when the consecutive inflammatory action has been slight and of long duration, *induration* of the surrounding cerebral texture takes place, the intellectual faculties having been generally much impaired in these cases; which, however, are much less frequently met with than those of consecutive softening.

42. There is no part of the brain exempt from the lesions described under this form of apoplexy, although they are most frequently observed in the corpora striata, the thalami, and the substance of the hemispheres. They likewise occur, though less frequently, in the cerebellum, annular protuberance, &c. In all these situations the paralytic symptoms affect the side opposite to that in which the lesions of the encephalon are seated. Some exceptions, however, to this have been recorded; but either the various circumstances connected with the cases, in which they have been said to have occurred, have been insufficiently investigated, or they admit of explanation without invalidating the accuracy of the general inference. Of *forty-one* cases in which extravasation of blood was found in the brain on dissection, by M. ROCHOUX, eighteen were in the left side, seventeen in the right, and six in both sides. Of these forty-one, there were twenty-four in the corpora striata; two in the thalami; one in both these situations; and one under the corpus striatum: making altogether twenty-eight cases in the corpora striata and vicinity. Of the remaining cases, five were in the middle of the hemispheres; two in the posterior part of the ventricles; two in the anterior and interior part of the hemisphere; three in the posterior and interior part; and one in the middle lobe. (See art. BRAIN, *Alterations in Substance — Hæmorrhage.*)

43. IV. APOPLEXY, COMMENCING WITH PARALYSIS, WHICH, AFTER AN INDEFINITE PERIOD, TERMINATES IN A COMPLETE APOPLECTIC ATTACK. — *A. Description.* The commencement of this form of disease is various. The patient often complains of pain, vertigo, and other symptoms referrible to the head; with want of recollection, loss of memory of words, cramps, pains, or with numbness, pricking, tingling, or weakness of a limb or limbs on one side, generally beginning in the hand. The speech is sometimes at first affected, or the mouth and eyes distorted; the limbs being subsequently paralysed. In many instances, the local symptoms continue in a state short of paralysis for a considerable time previously to this state being fully developed. In this case, inflammatory action seated in a part of the brain has often existed, although the symptoms have been so obscure as not to have been detected. After a period of indefinite duration, the paralytic symptoms are followed by a complete apoplectic seizure, occasionally preceded or accompanied with spasms or convulsions of the unparalysed limbs; or the attack supervenes on repeated aggravations, or after a gradual increase and extension, of these symptoms. In some cases, the patient sinks gradually into a comatose state; from which he may at first be partially roused, and give rational answers, the state of complete loss of sensation and voluntary motion having gradually advanced. From this state the patient seldom or ever recovers. In certain cases the apoplectic seizure is more sudden, but is not so profound, or it passes away more quickly than in others. The apoplectic attack having occurred, the patient is either carried off by it, or he recovers after a time the state in which he was previous to it, or he is left by it in a still worse condition: either gradually sinking, and at last dying in a state of exhaustion or coma; or experiencing a recurrence of the apoplexy, which terminates his existence. This forms a variety of M. CRUVEILHIER's second species of apoplexy. It is often a result of previous acute disease, proceeding from a feeble capillary exudation.

44. As soon as the patient suffers the first complete apoplectic seizure, the *progress* and *termination* of the disease very closely agrees with the description given of the immediately preceding form; but the appearances observed on dissection are frequently somewhat different, and are altogether much more diversified.

45. *B. Appearances on Dissection.* — Many of the changes observed after this form of the disease are entirely similar to those described under the foregoing head (§ 41.); whilst others fall under a different article, where they are fully described (see article PARALYSIS). There are some lesions, however, which seem more strictly related to the present variety of complicated apoplexy, than either to the other varieties of the disease on the one hand, or to simple paralysis on the other. The most frequent morbid appearance which I have met with in this form of apoplexy, or seen described in the works of BAYLE, RECAMIER, CAYOL, ROSTAN, RIOBÉ, SERRES, CRUVEILHEIR, LALLEMAND, BOUILLAUD, ABERCROMBIE, and GENDRIN, who have paid great attention to its pathology, consists of softening, with a reddish tint, of a portion of the brain. In cases which I have examined, the softening was accompanied with *infiltration* of blood into the cerebral structure. In some cases the softening and infiltration increased from the circumference to the centre, whilst in others the change from the healthy state to this took place abruptly; the diseased part presenting the appearance of a cavity containing a softened and reddish pultaceous mass, which could be removed without evincing any connection with the surrounding brain. In some instances the softened part is of a yellowish green tint, and the surrounding portion of brain more vascular than natural. The parts most commonly affected with this lesion are nearly those which are most frequently the seat of hæmorrhage; the chief difference being, that the grey substance of the hemispheres is oftener the seat of the former than of the latter.

46. As to *the origin* of this particular form of softening of the cerebral structure, I must refer the reader to what I have adduced respecting it in the *article* on the *Alterations in the substance* of the BRAIN. As, however, the origin of this

species of softening has a very intimate relation to the treatment of this class of cases, it becomes a matter of importance to trace its origin. The French pathologists, with very few exceptions, ascribe it to inflammation of the cerebral structure. There can be no doubt that it sometimes proceeds from this source. But as soon as the inflammatory action has given rise to this change, the vessels no longer enjoy their requisite tone, — their vitality has evidently become exhausted, and they allow the red particles of blood to escape from them, and to be infiltrated into the cerebral structure; as we observe sanguineous infiltrations into the parenchymatous structures to occur in scurvy or in purpura hæmorrhagica. When the softening arises from this cause, the paralytic and apoplectic seizure more frequently is met with in patients not far beyond the middle age, and whose constitutions are not much injured; and the attack is more commonly preceded by acute or febrile symptoms, than when it proceeds from the cause about to be adduced.

47. Dr. ABERCROMBIE considers that it also depends upon disease of the arteries, chiefly ossification, thickening, contraction, or separation of their inner coat, occasioning a failure of the circulation, and gangrene of the part of the brain which is supplied by the diseased vessels as is observed to take place in the toes of aged persons. This may possibly occur; but still we have no satisfactory proof that it does so. This far I may concede,—that the disease proceeds from a change of a state of the capillaries of the part, and of the cerebral structure in which they ramify, otherwise, we should not observe infiltration of blood, and great softening of structure; but which of the two is the primary lesion is very difficult to determine. Most probably, both are dependent upon the state of that part of the ganglial system which supplies the encephalon, particularly its blood vessels.

48. The other appearances with which this lesion is associated in this form of the disease, consist of the morbid states of the arteries of the brain already noticed; of aneurisms (BLANE records a case which arose from rupture of aneurism of the internal carotid); congestion of the vessels, veins, and sinuses; more rarely extravasations of blood in some one of the situations and states already noticed, or the remains or marks of antecedent hæmorrhage; empty cysts from which coagula have been absorbed; portions of the brain in various degrees of induration; purulent collections in different forms; encysted and ther tumours of various descriptions; a large proportion of the lesions described in the articles on the *Alterations in the substance* of the BRAIN; thickening, injection, or ossifications of the membranes; and, occasionally, accumulations of serum in the sub-arachnoid cellular tissue, and in the ventricles. The further exposition of this form of the disease, especially in relation to the *paralytic* symptoms, falls more appropriately under the head of PARALYSIS, where they are fully discussed.*

49. OF THE PHENOMENA OF THE DISEASE WHICH HAVE NO PARTICULAR DEPENDENCE UPON ITS SEPARATE FORMS. — *A.* There are *certain symptoms* occasionally met with in all the states of apoplexy, to which I shall briefly refer. The *pulse* is frequently full, strong, and slow, or of natural frequency, particularly in the *first*, *third*, and occasionally in the *fourth* varieties into which I have divided the disease. In other cases, especially in those which are extreme, and particularly in the *second* and *fourth* varieties, it is often small, feeble, and unequal or irregular. The *respiration*, both as to strength and frequency, generally presents similar characters with the pulse: when the latter is slow and strong, the former is deep, slow, and stertorous; and when the pulse is weak and frequent, respiration is quick, less laboured, and much less sonorous. *Deep sighs* are occasionally observed in all the forms of the disease. The *state of the pupils* is very various: sometimes they contract and dilate independently of the influence of light; but in the *first* and *third* varieties they are generally dilated; and they are often contracted, or one is contracted and the other dilated, in the *second*, *third*, and *fourth* varieties. Contraction of the pupils has been remarked as a not infrequent attendant on the worst forms of apoplexy, and particularly on those characterised by a tendency to spastic action, by ARETÆUS, and recently by CHEYNE, COOKE, and various other pathologists. The *features* are usually large, bloated, relaxed, and flushed; but they are sometimes pale, and even collapsed, particularly in the ingravescent and consecutive forms of the malady. The *fæcal* and *urinary evacuations* sometimes take place involuntarily, in all the varieties of the disease.

50. The *muscles* most frequently paralysed, either antecedently, consecutively, or at the same time, with apoplexy, are those of the superior and inferior extremities, particularly those of the superior; next those of the tongue and face; and lastly, the muscles of respiration. In general, the power of feeling is more or less deficient, as well as of voluntary motion of the affected

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* I may subjoin the following classification of apoplexies, according to a different principle to that adopted above. It is based upon the chief pathological states from which the attack proceeds, and approaches nearer the arrangements adopted by the German pathologists, particularly HARLESS (*Der Speciellen Nosologie, &c.*, p. 131. Cobl. 1824.), than that usually followed by our own writers. In some respects it may be preferable to that which has been now fully described, particularly as I have here placed those forms of the disease which depend upon the nervous or vital energy of the encephalon in a more prominent point of view, than they can hold in a classification framed according to the symptoms and mode of seizure, in connection with the internal lesions.

I. SANGUINEOUS APOPLEXY, — with extravasation of blood in some part within the cranium.

II. CONGESTIVE AND SEROUS APOPLEXY, — from obstructed return of blood from the head, and frequently from the metastasis of gout, rheumatism, or eruptive diseases.

III. ASTHENIC APOPLEXY, — *Nervous Apoplexy of Authors*, — from depression, exhaustion, or abolition, of the vital influence bestowed on the encephalic organs, and occasionally giving rise to extravasation of blood, or of serum, and to congestion of the cerebral vessels.

A. From *intoxication.* *B.* From *narcotic poisons*, and *mephitic gases.* *C.* From a *stroke of lightning.* *D.* From the *influence of great or continued cold.* *E.* From *exhaustion* of the mental and bodily powers, and from convulsive affections. *F.* From violent *mental emotions.*

IV. APOPLEXY FROM PRE-EXISTING CHRONIC LESIONS WITHIN THE CRANIUM, — from tumours, inflammations, abscesses, &c. &c.

V. TRAUMATIC APOPLEXY, — From external injuries. *Concussion*, or shock of the vital powers of the organ; — *pressure* from depression of bone or extravasation of blood.

VI. COMPLICATED APOPLEXY, — supervening at the invasion, or advanced stages of febrile diseases of an adynamic or asthenic type.

limb or side; but sometimes voluntary motion is lost, whilst sensation remains. There are also very rare cases recorded, where the feeling only was lost, and sensation has been observed paralysed on one side, and motion on the other. These phenomena will be more particularly considered and explained in the article on Paralysis. As the patient convalesces, sensation returns in the paralysed limb before the power of voluntary motion; and generally the lower extremity recovers its functions before the upper, unless disease of the spinal chord, producing more or less of paraplegia, coexist with, or is consequent upon, the apoplectic disease, — an occurrence which is sometimes met with.

51. *B. The duration of the apoplectic* state is extremely various. The attack may terminate fatally in a few minutes, particularly the *first* variety; or it may pass away in as short a time, and the patient recover, especially in *this* and the *third* form of the disease. Dr. Cooke thinks that death seldom or ever occurs in less time than one or two hours, in genuine apoplexy; and, I believe, as respects those apoplexies which consist of cerebral hæmorrhage, this is generally the case; but when large hæmorrhage takes place into the ventricles, and about the base of the brain, death is very quickly produced. An attack often, however, continues for a much longer time, generally from several hours to as many days. If no remission of the symptoms be observed after twenty-four hours, the disease generally terminates unfavourably. The progressive or ingravescent variety sometimes continues for several days; the apoplectic state becoming more and more profound; and at last usually ending fatally.

52. *C. The termination of apoplexy* has already been noticed, when describing the different forms of the disease. I may, however, remark generally that the attack may end as now stated, or it may go off completely, leaving no further ill effects than a tendency to recur upon the action of the remote causes. This favourable termination, however, is entirely owing to the nature of the causes; a larger proportion of cases either terminates in, or is accompanied with, paralysis. When the speech and mental faculties are affected in a marked manner from a first attack, they return but slowly; the memory, the strength of mind, and force of character, are more or less impaired; the patient becomes weak, puerile, easily excited, and timid; and a disposition to a subsequent attack is produced, which either carries him off, or weakens still further his mental and motive powers, until perfect imbecility of mind and body is occasioned. Sometimes, after repeated attacks, with marked injury of the mental faculties, a considerable diminution of the volume of the cerebral convolutions is observed upon dissection, — they no longer fill the cranial vault; but the space is occupied by a greater or less quantity of serum infiltrated in the subarachnoid cellular tissue, and not only on the exterior surface of the convolutions, but also between their anfractuosities. In some cases this change is more remarkably developed in certain convolutions than in others, or in those of one lobe or hemisphere than in the rest.

53. *D. The changes* which the seat of hæmorrhage undergoes have already been described at length (§§ 37—40.). The most remote changes which have been observed in the ruptured part of the brain, from which the coagulum has been absorbed, are, in some cases, a complete cyst, either empty or enclosing a little reddish serum, or a loose cellular substance; in a few instances, a firm nucleus, seemingly consisting of the fibrinous remains of the coagulum, and in others, according to Cruveilhier, merely a linear induration from the cicatrisation of the lacerated cerebral structure. In whatever form the remains of the coagulum and laceration may present themselves, at periods remote from the seizure which these lesions occasioned, no *direct* union of the divided fibres of the brain is observed to have taken place. Even when an *apparent* union of the divided cerebral structure is noticed, it will be found to have been brought about indirectly, and through the medium of the cellular or fibrinous substance left after the absorption of the coagulum; the cavity having gradually closed, owing to the atrophy of the ruptured fibres, and the hypertrophy of those surrounding them from having had to perform additional offices.

54. *E. Of the supposed relations subsisting between the seat of hæmorrhage, or lesion of the brain, and the symptoms accompanying and following the attack.* — M. Cruveilhier states that those parts of the brain most subject to hæmorrhage, or laceration from the external injuries occasioning counter-stroke of the cranium, most commonly present extravasation of blood in apoplexy. This seems to some extent correct, as far as relates to corresponding frequency; but there are parts of the encephalon, occasionally the seat of apoplectic hæmorrhage, which are seldom or never so affected from this species of external injury.

55. *a.* It has been supposed by MM. Serres, Foville, and Pinel-Grandchamp, that lesions of the *corpora striata* are followed by paralysis of the lower extremities, and those of the *thalami* by palsy of the upper. This inference is, however, neither supported by anatomy, nor borne out by facts: a mere coincidence of internal lesion with external signs cannot always warrant the inference that the disordered function has its origin in the part diseased, especially when we are ignorant of the offices of such part. The upper and lower extremities are most frequently paralysed from apoplexy; and the corpora striata and thalami are the parts in which the apoplectic hæmorrhage most frequently occurs. Hence the coincidence of these lesions of structure and functions must be frequent. But these parts of the brain are sometimes diseased without the correspondent affection of the limbs contended for; whilst, on the other hand, the extremities are often paralysed without any lesion of those parts.

56. *b.* The disciples of Gall consider the *anterior lobes* of the brain as presiding over the organ of speech, and as the seat of the memory of words, &c., and that therefore lesions of this part affect this organ, as well as this particular state of recollection. M. Bouillaud has supported this opinion by the history of several cases; and M. Cruveilhier has controverted it, by adducing the details of others (*Nouv. Biblioth. Méd.* 1826.). Several other French pathologists have also espoused opposite sides, and adduced cases supporting their views. The inference deducible

from the facts already accumulated is, that a coincidence of lesion of these functions, and of these parts of the brain, is sometimes observed; but the relation between them is neither so uniform nor so precise as to warrant the opinion that there exists any necessary dependence of these particular functions upon the parts of the brain to which they have been ascribed. Without reference, however, to the part of the brain on which the memory of words depends, it has been remarked by M. Itard, that aged persons struck by apoplexy frequently lose the recollection of them in the following order: — First, want of recollection of proper names, next of substances, afterwards of verbs and adjectives; which last are often the only words which can be recollected.

57. *c.* It was contended by MM. Delaye, Foville, and Pinel-Grandchamp (*Nouv. Journ. de Méd.* 1821.), that disturbance of intelligence depends upon lesion of the *grey substance* of the brain, whilst disorder of locomotion proceeds from change of the white or *medullary structure*. But this doctrine seems no better founded than the preceding, being open to the same objections which have been urged against them. Lesion of the cineritious substance is, perhaps, more frequently accompanied with spasms and convulsions at the commencement of the attack, than when it is seated in the medullary structure.

58. *d. The cerebellum.* Morgagni has recorded that Valsalva once stated to him, that a case of apoplexy to which he was called was seated in the *cerebellum*. Dissection verified the *diagnosis*; but he does not mention the symptoms on which Valsalva founded his judgment. M. Serres, adopting the doctrine of Gall, says, that erections, or seminal emissions, in men, and discharges, sometimes of a sanguineous appearance, from the female organs, are the distinguishing signs of apoplexy of the cerebellum. M. Cruveilheir states, that he has seen apoplexy of this part, but that these symptoms were not present. Some cases have certainly occurred to countenance the opinion of Serres, and others to overthrow it. It seems more probable that the effusion in the cerebellum affects the *medulla oblongata*, and occasions a partial asphyxia and stasis of the blood, from the influence of this part upon the respiratory class of nerves, and thus induces a state favourable to erection. Cruveilhier states that he failed to produce this symptom by irritating the cerebellum of dogs. I may, moreover, add, that the symptoms contended for by Serres, and the followers of Gall, as distinctive of cerebellic apoplexy, have occurred in cases wherein the cerebellum has been found sound on dissection.

59. Apoplexy of the *cerebellum* occasions, *cæteris paribus*, a more serious lesion of the functions of circulation and respiration, and is more dangerous than apoplexy of the cerebrum. The symptoms are evinced on the side opposite to the seat of lesion, in this as in other apoplexies. The opinions that the cerebellum is the regulator of all the voluntary movements, and the source of all sensibility, according to certain Continental physiologists, particularly MM. Flourens, Fodera, Foville, and Pinel-Grandchamp, have not been confirmed by the history of apoplexy seated in it. The hypothesis of Rolando, professor at Turin, that the cerebellum performs a function analogous to the Voltaic pile, in generating a fluid or principle requisite to the functions of voluntary muscular action; and that it transmits this fluid, under the influence of the brain, and through the channel of the spinal chord and nerves, to the muscles; seems much more accordant with comparative physiology, and the pathology of the nervous system.

60. *e. The annular protuberance*—the point of junction of the spinal chord, brain, and cerebellum — the centre of the cerebro-spinal system, is sometimes the seat of apoplexy, notwithstanding its density. When the extravasation of blood in this part is to any considerable extent, immediate and complete paralysis of the trunk, and of both the superior and inferior extremities, is produced, with the most profound lesion of respiration, quickly followed by death. When the effusion is to a small extent, and in one side of the protuberance, the paralysis which results seems on the opposite side of the body, as may, indeed, be inferred from anatomy. The extravasation must be to a small extent, to admit of recovery. Sometimes the effused blood is observed to have been disposed in layers between the lamina of white matter entering into the structure of the protuberance. The reparation of the apoplectic lesion of this part takes place in a similar manner to that which I have already described (§§ 37—40.). It would seem that the smallest division of the fibres of this part is followed by permanent affection of feeling and motion.

61. Connected with this subject, M. Flourens concludes, from his experiments and observations, that the cerebral lobes, the cerebellum, and the tubercula quadrigemina, may lose a considerable but limited portion of their substance, without losing the exercise of their functions; and they may re-acquire them after being totally deprived of them: that the spinal marrow and the medulla oblongata are the only parts which directly affect the same side of the body with that in which they themselves are affected; whilst the tubercula quadrigemina, the cerebral lobes, and the cerebellum, alone produce these effects upon the opposite sides to that in which they are diseased,— the former acting in a direct course, the latter in a cross direction. These inferences, however, want confirmation in several particulars.

62. Diagnosis. — Apoplexy is, in general, readily recognised: but it may occur in such a way and under circumstances which will render its diagnosis a matter of difficulty. Thus we may be called to a patient, of whom nothing is known, with the following symptoms: — Coma, laborious or stertorous breathing, relaxation or rigidity of the limbs, complete loss of consciousness; he may or may not have had convulsions, or a blow upon the head; there may be hemiplegia or not. In this case, is the patient in a state of dead drunkenness, asphyxied, poisoned by narcotics, or affected with the profound coma consequent upon epileptic or hysteric convulsions? Is it concussion of the brain; the advanced effects of organic disease within the head — as of cysts, abscess, or of inflammation terminating in effusion; or fever, either at its commencement or close, with apoplectic symptoms? It is true that these states differ but little from apoplexy;

the difference consisting chiefly in grade, unless hæmorrhage has taken place, when paralysis generally manifests itself. But it should be at the same time recollected, that there is sometimes hæmorrhage without local palsy, and even palsy without sanguineous extravasation. The diagnosis of such cases is very important; but without information of the circumstances connected with the history of the case, its difficulty is extremely great. I once treated a case of adynamic fever, originating in infection, and commencing with sudden loss of sense and voluntary motion, as a case of apoplexy, and gave an opinion accordingly. The history of the case, and its subsequent course, showed the error. When paralysis is present, the nature of the case is then manifest, although the particular cause of the palsy may be a matter of doubt. We should, therefore, enquire after this symptom, by observing the attitude and motions of the patient, by pinching the extremities, tickling the soles of the feet, &c. The existence also of stertorous, laborious, or snoring respiration, will confirm the diagnosis.

63. It should be kept in mind that, whilst the comatose state consequent on *epilepsy* or *hysteria* may closely resemble apoplexy, the convulsive stages of these diseases may give rise to the true apoplectic state. But, in the usual consecutive coma of epilepsy there is no stertorous breathing, and the limbs are not so relaxed as in apoplexy. The *coma*, which supervenes to inflammation of the membranes of the brain, is chiefly to be distinguished from apoplexy by the antecedent symptoms, and by the loss of sense and cerebral function being greater than the loss of motion; independently of the association of paralysis so frequently characterising the apoplectic seizure.

64. The symptoms consequent upon *injuries of the head*, whether simple concussion, or compression from depressed bone, or extravasation of blood, are in all respects identical with certain of the varieties of apoplexy described above, and are not to be distinguished from them, but in respect of the exciting cause. A similar remark is applicable to cysts, tubercles, and other tumours slowly developed in the encephalon, which sometimes produce no very marked external sign of disease, until apoplexy and still more frequently hemiplegia suddenly take place. In such cases there is no actual difference in the proximate cause of the abolition of function, but only in the compressing body whereby abolition of function is occasioned.

65. In cases of loss of sense and voluntary motion from the action of *narcotic poisons*, or breathing *deleterious gases*, there is also little actual difference from several of the apoplectic states described above (§ 10.), excepting that the functions of the lungs have, in the case of breathing deleterious gases, been primarily affected; for the chief lesion is to be referred to the state of *nervous energy* and *vascular action* in the brain, its circulation being retarded, and its vessels congested with dark blood. Indeed, in many such cases, the true apoplectic condition, either with or without hemiplegia, is produced; although, in the majority, the state of profound but simple coma is the result.

66. In *asphyxia* the lesion of function commences in the lungs, the pulse being either diminished in strength or entirely abolished; whilst in apoplexy the lesion is in the head, and the pulse is generally fuller and stronger than natural; but the exceptions to this state of pulse are numerous. In *syncope*, the marked diminution, or almost entire absence, of the pulse, paleness of the countenance, and the very gentle or scarcely apparent respiration, are sufficient to distinguish it from apoplexy, even in its weakest forms; excepting at the commencement of, or early in, the apoplectic attack, when the states of vital energy of the brain, in both affections, are not materially different.

67. Complete *intoxication* may readily be mistaken for apoplexy; and, in some cases, may terminate in this disease. This state of intoxication is evidently attended with congestion of the vessels of the encephalon. The smell of the breath, and the appearance and smell of the matters thrown up by the retching that frequently accompanies intoxication, will readily distinguish this state. The greater frequency, also, of the pulse, and absence generally of stertorous breathing, in drunkenness, will also assist the diagnosis. But these symptoms are occasionally observed in apoplexy; and, on the other hand, the pulse may be slow or natural, and the breathing stertorous in the former: but this is very rare, particularly slowness of the pulse.

68. In *concussion* of the brain, the state of its circulation, and the influence of that portion of the ganglial system which supplies it, are as remarkably depressed as in the weakest form of apoplexy,—in concussion from the shock received, in apoplexy from internal causes; in many cases no difference existing. In some instances, however, even of this form of apoplexy, the respiration is much more laborious, the countenance somewhat more tumid or distorted, and the pulse fuller and more developed than in concussion. In the stronger states of apoplexy there can be no risk of mistake, the characteristic symptoms of each being very different.

69. PROGNOSIS. — An attack of apoplexy is always dangerous: — 1st, It may be fatal immediately; 2d, It may also be fatal within two or three days, and previous to reaction having commenced; and, 3d, It may occasion death during reaction, — *a.* by a recurrence of the attack; *b.* by inflammatory softening and infiltration of the cerebral tissue surrounding the extravasated blood; *c.* by the exhalation of serum; *d.* by inflammatory action of the membranes of the brain and subjacent cellular tissue, and of the membrane lining the ventricles. Even in more favourable circumstances, it leaves behind it debility of feeling, motion, and of the mental faculties; and a first attack is generally followed by a second or even a third.

70. *A.* The *unfavourable* symptoms are frequency or intermittence of the pulse; continuance of the symptoms for twenty-four hours, or for little more than half of this time in the *strong* apoplexy, after a judicious treatment; very profound coma, and obtuseness of the senses; involuntary discharges of the urine and fæces; contraction of the pupils, or contraction of one or both pupils accompanied with spastic actions of muscles; very laborious stertorous breathing, particularly if attended with foam about the mouth, and a weak pulse; cold and profuse sweats; the occurrence of convulsions; the association of

hemiplegic symptoms with the apoplectic, and complete loss of vision. Frequent yawning or continued somnolency indicate effusion, or increasing effusion. QUARIN observes very justly, that when the patient frequently applies the hand to a determinate part of the head, or when delirium supervenes, or if partial perspirations occur early in the attack without benefit, the result is generally fatal. Complete hemiplegia, without coma, but with integrity of the mental faculties, and perfect motion and sensation of the non-affected side, is less dangerous than a more partial paralysis, with stupor or coma. When one pupil is contracted and the other dilated, the existence of unequal pressure may be inferred. It has generally been stated that complete loss of feeling and motion, accompanied with coma or stupor, is extremely dangerous. CRUVEILHIER remarks that he has seen recovery in such a case. I have met with it in two cases, one of which was seen by Dr. HOOPER.

71. Delirium is an unfavourable complication; and indicates either the escape of blood from the seat of extravasation upon the membranes which it irritates, or the occurrence of inflammation of the cerebral structure or meninges. Acceleration of the respiration, and vomiting supervening spontaneously, unless from matters occasioning the attack, are very dangerous symptoms. A similar remark is applicable to loquacity, or complete loss of speech, particularly when attended with a frequent pulse.

72. When the disease occurs in the course of insanity, or in epileptics, an unfavourable result may be generally anticipated; a nearly similar conclusion may be drawn if it seize aged persons, and broken constitutions, upon the disappearance of gout from the extremities. In the majority of cases of apoplexy proceeding from efficient causes originating in the brain, a perfect recovery is not to be expected. On this, M. PORTAL has insisted strongly; and although it is just as a general rule, many exceptions will present themselves. If the pulse sink, or intermit, or become remarkably quick; and coldness of the extremities, or cold clammy sweats come on; or the power of respiration be greatly diminished; inevitable or fast approaching dissolution may be predicted.

73. *B.* The *favourable* signs of the disease are, a moderate attack; a decline of the symptoms after treatment, and particularly if a warm, general, and gentle perspiration take place; the occurrence of discharges of blood from the nose, hæmorrhoidal vessels, or uterus; and a free state of the bowels, with consciousness of all the evacuations. The accession of the menses, of the piles, or of ptyalism, have been justly viewed as the most favourable signs by HIPPOCRATES, SCHADT, DOLÆUS, and many subsequent writers. GOAVARTS considers hæmorrhage from any part, particularly epistaxis, ptyalism, a copious and general perspiration, with free alvine and urinary discharges, the most favourable signs. The accession of fever has been considered favourable by HIPPOCRATES and PORTAL; but many experienced authors do not agree with them. I believe that, although some may recover from this state, it indicates the accession of inflammatory action of the portion of brain or membranes adjoining the seat of hæmorrhage; which will be dangerous in respect of the extent to which it may proceed, and the effects it may produce on the part, particularly in causing a renewal of the hæmorrhage. In all cases, the practitioner, even under favourable appearances, should give a cautious prognosis until the tenth day; the eighth being that on which an unfavourable change is apt to occur, and the extravasation to be renewed.

74. CAUSES.—The causes of apoplexy, both predisposing and exciting, have generally a direct or indirect influence upon the state of the vital energy and circulation of the brain. The manner, however, in which causes may individually influence either the vital condition or circulation varies extremely; and the action of several of them is even peculiar. Those causes, which in some cases are merely predisposing, may in others be exciting; and changes previously induced in the organisation of the brain, or in the state of its vessels, even from causes which lead to other maladies, may, either directly or indirectly, occasion apoplexy.

75. *A. The predisposing causes of apoplexy.*—This disease occurs most frequently in persons of the *male* sex, owing to their habits, and greater exposure to the exciting causes; and in the *far advanced stages of life.* The majority of authors state the period intervening between forty and seventy as that in which it is most common; but it is not infrequent at both earlier and later epochs, particularly the latter. M. ROCHOUX found, in 63 cases attended with extravasation of blood, that 2 were between 20 and 30 years of age, 8 from 30 to 40, 7 from 40 to 50, 10 from 50 to 60, 23 from 60 to 70, 12 from 70 to 80, and 1 from 80 to 90 years. I have met with the true hæmorrhagic apoplexy at the early age of eighteen. The *hereditary* tendency of the disease, as shown in several instances by FORESTUS, WEPFER, PORTAL, BLANE, FRANK, and others, cannot be doubted.

76. *The form and habit of body* may also predispose to the attack; but, I believe, much less frequently than is usually supposed. A large head, short neck, full chest, sanguine and plethoric constitution, and corpulency, are generally considered signs of disposition to it; but the state of the heart's action, and of the circulation through its cavities, with a plethoric state of the vascular system, has a more marked influence, as will appear in the sequel. In the 63 cases which have been minutely analysed by M. ROCHOUX, only 10 were fat and plethoric persons, 23 were thin, and 30 were of the ordinary habit of body. He therefore maintains that there is no external appearance of habit and temperament whereby the disposition to apoplexy is indicated.

77. Long and intense thought; disappointments; depressed and anxious states of mind; the habitual indulgence of the temper, passions, and appetites; the irritable and sanguine temperaments; sedentary and luxurious living; too great sexual indulgence, particularly when accompanied with full living; habits of intoxication, or the too free or constant use of wine and malt liquors; laborious employments, especially when they require the stooping posture; the suppression of accustomed hæmorrhages, discharges, or habitual diseases, particularly those which are accompanied with evacuations; and the neglect of vascular depletion after their suppression; the influence of other diseases, particularly those of

the heart, liver, lungs, kidneys, and digestive organs; a gouty diathesis; extremes of temperature, particularly when conjoined with moisture; sudden vicissitudes of temperature; frequent indulgence in sleep after a full meal; the use of neckcloths worn too closely around the neck; sleeping with too low a pillow, particularly after a meal; and lying too long in bed; are among the most common predisposing causes of apoplexy.

78. Alberti and Seiz have insisted on the greater frequency of this disease amongst the *studious* than in other classes. Frank says that the greater proportion of his apoplectic patients had been previously subject to hæmorrhoids. The use of *tobacco*, particularly in the form of snuff, has also been considered to favour the occurrence of apoplexy. As to the influence of *weather and seasons*, it may be stated, that Morgagni and Lancisi observed this disease most frequently in hot weather suddenly following cold and rainy seasons. Kaiser says that he met with the greatest number of cases in the months of October and November; and Hippocrates, Galen, Forestus, Kellie, and others, have noticed the influence of cold in producing it. I believe that very *cold weather*, or cold conjoined with moisture, favours its occurrence in very old subjects; and that very hot and moist seasons occasion it in robust and plethoric persons. The influence of hot weather in its production has been insisted on by Morgagni and Cheyne. The Franks found apoplexy most prevalent at Petersburgh and Wilna during the height of summer (J. Frank, *Prax. Med. Univ. Præcep.* t. ii. p. 308.).

79. Apoplexy seems to be as frequent in the *poorest* as in the *richest* classes; but in the former it is more commonly attended with paralysis, and oftener assumes an asthenic or *weak* character, the attack chiefly proceeding from frequent exposures to the vicissitudes of season and temperature, to severe and long-protracted exertion, and a less nutritious diet. In the latter it more generally assumes the *strong* or active form, arising most frequently from ease, luxury, and various indulgences.

80. It will be observed that nearly all these causes act by habitually favouring determination of blood to the head, or by impeding its return, and by diminishing the vital energy of the brain at the same time that they favour a plethoric state of its capillary vessels. These derangements of vital manifestation and of circulation, when frequently produced, will occasion further changes, and sometimes will, upon the occurrence even of the slightest exciting causes, terminate in those lesions which constitute the disease itself.

81. *B. The exciting causes* frequently act in a similar manner to the foregoing; but generally in a more sudden manner and intense degree. These are, immoderate perturbations of mind, as consternation, terror, fear, despondency, anger, disappointments, anxiety, distress of mind from losses, sorrow, violent chagrin, great joy, immoderate fits of laughter, and all painful, depressing, or exciting mental emotions and exertions. Numerous illustrations of the immediate influence of the above passions in producing the disease are to be found in the writings of Aretæus, Forestus, Zuliani, Portal, Boucher, Cheyne, Cooke, Abercrombie, &c.

82. *Intemperance* in eating and drinking is amongst the most common exciting causes of the disease; and numerous instances of its immediate ill effects are adduced by the above writers, and by Bonet, Morgagni, Mead, Fothergill, and others. Oppletion and distension of the stomach prevent the descent of the diaphragm, impede the dilatation of the cavities of the heart, obstruct the circulation through the lungs and the return of blood from the head, whilst the vital energy is abstracted from the brain, and determined to the digestive organs, in order to dispose of the load by which they are oppressed. Owing to this procession of phenomena the vessels of the encephalon are engorged at a time when their vital energies are diminished; while the rapid influx of fluid matters into the circulation as the process of digestion advances, tends to heighten the vascular fulness and disposition to effusion. Besides, habitual intemperance of this description generates a plethoric state of the system, with congestions of internal viscera. Spirituous liquors are seldom productive of apoplexy until after a continued addiction to them, unless they are taken in excessive quantities; and perhaps the habit of drinking much malt liquors or wine is still more frequently a cause of the disease, than indulging in spirits, which, when they occasion apoplexy, act more upon the vital endowments of the brain, than in causing extravasation of blood; the chief changes produced by them, being serous effusion with injection of the vessels. Sir A. Carlisle has adduced a case of apoplexy, arising from drinking an immense quantity of gin. Upon dissection, the odour of the spirits was detected in the serum effused in the ventricles of the brain.

83. Connected with the use of spirituous or fermented liquors, I may here allude to the influence of the class of *narcotics*, particularly opium, stramonium, hyoscyamus, tobacco, &c., the excessive use of which sometimes occasions all the symptoms of congestive apoplexy, and even extravasation. Of all the narcotics, the different species of monkshood most readily occasion apoplexy, when taken by mistake. I was lately consulted in the case of a young man who had incautiously chewed some seeds of this plant; he was shortly afterwards seized with a sense of numbness of the face, soon followed by complete apoplexy, as described under the third variety of the disease, from which he recovered with great difficulty, and with palsy of one side, with which he is still affected, now upwards of a twelvemonth from the time of attack.

84. Nearly allied to the operation of narcotics is that of the fumes of charcoal, and various *mephitic gases*, which, whilst they diminish, or altogether arrest the changes affected by respiration on the blood, thus occasioning asphyxia, and carus without stertorous breathing, sometimes produce all the symptoms of complete apoplexy, owing to their effects upon the vital endowment of, and circulation in, the brain. In respect of the *modus operandi* of narcotics and deleterious gases on the system, somewhat different opinions have been entertained by Cullen, Goodwyn, Currie, Orfila, Brodie, and others who have investigated the subject. There can, however, be no doubt that they act chiefly upon the ganglial system, particularly on that part

which actuates the brain, when they produce apoplexy, destroying the influence of this system on the vessels of the encephalon, and thereby retarding the circulation in, and favouring congestion of, its capillaries, and interrupting the functions of the organ.

85. Violent straining in lifting heavy weights, or *muscular exertions;* straining at stool; the venereal act, particularly under unfavourable circumstances, or too frequently repeated; the metastasis of other diseases, especially of gout and rheumatism; whatever impedes the return of blood from the head, as a dependent posture of the head, or holding it long in an averted position, or looking backwards without turning the body, particularly when the neck is short; sleeping upon too full a meal, especially with a neckcloth or other ligatures around the neck; violent fits of coughing or sneezing; pregnancy and child-birth; exertion of body, with an anxious mind; stumbling; the use of the warm bath; and the sudden exposure to heat or cold; are among the most frequent exciting causes of apoplexy.

86. The effect of the *sun's rays* in producing what is commonly called *coup de soleil*, is well known. Many of the seizures thus occasioned amount to complete apoplexy, in some one of its forms, particularly the first and third. But other conditions of *heat* will also sometimes occasion an attack, as heat combined with moisture, and the exhalations from a number of persons crowded together in ill-ventilated apartments. The influence of crowded rooms and assemblies in causing apoplexy is well known, and in occasioning headach, and sense of fulness in the vessels of the encephalon, even in persons not predisposed to an apoplectic attack.

87. *Cold* also, particularly when applied suddenly to the surface of the body and lungs, excites the disease in aged persons, whose vital energies are already greatly impaired. The vessels of the brain in this class of subjects are weak, fragile, and liable to rupture, or to permit a portion of their serous contents to escape. Besides, cold depresses still lower the vital powers of the frame, and tends to retard the circulation, whilst it drives the blood from the surfaces into the large viscera, and particularly into the encephalon, which, from its unyielding case and exemption from atmospheric pressure externally, is more obnoxious to congestion, retarded or interrupted circulation, and compression from vascular fulness, than any other organ; occasioning lethargy in the robust or young, and apoplexy in the old or predisposed. Cases illustrative of apoplexy produced by long exposure to great cold, particularly when the disposition to sleep which it induces is yielded to; by the incautious use of the cold bath, and of ice applied to the head; and by the practice in Russia and Poland, of using a snow bath after the warm bath; have been recorded by Wepfer, Walther, Penada, Macard, Brandis, Kellie, Portal, and Frank. Of about fifty perfect cases of the disease, the *causes* were analysed by Dr. Cheyne, and ranked as follows: — 1st, Drunkenness and habitual indulgence in exciting liquors; 2d, The form of the body; 3d, Temperament, sanguine, sanguineo-choleric, choleric; 4th, Gluttony; 5th, Indolence; 6th, Mental anxiety; 7th, Fits of passion; 8th, Externa heat; 9th, The use of tobacco. (*On Apoplexy and Lethargy*, p. 149.)

88. *C. Modus operandi of the above causes.* — If we endeavour to trace the relation subsisting between these causes, and what we know of their uniform effects, either upon the brain or on other parts of the body, we shall find that they tend first to excite, and afterwards to exhaust, the vital energy, and to distend the capillaries of the part. Now, as the brain is enclosed in an unyielding case, it must follow that, when the capillaries are excessively distended, the veins, which are the most yielding, will be proportionately compressed, whilst the force of the circulation in the arteries will tend to perpetuate this distension, and consequently the compression of the veins. Thus the circulation will be retarded; the portion of the ganglial system supplying the brain be likewise, to a certain extent, benumbed by the increased pressure to which it is subjected, and the functions of the organ abolished, even without extravasation having occurred. Upon dissection after death, the blood, which had distended excessively the capillaries, will be found to have passed into the veins, giving the appearances of venous congestion merely, as is uniformly observed in other parts of the frame, which have been the seat of congestion, without inflammation, — venous congestion, at least to any considerable extent, being incompatible with the physical condition of the encephalon during the life of the patient, unless it be occasioned by impeded return of blood through the sinuses and large veins, although congestion of its capillaries undoubtedly frequently exists.

89. When *hæmorrhage* takes place, the effused fluid will occasion more or less pressure, according to its extent; but, from the condition of the encephalon, the pressure will almost equally affect all parts of it; the blood being thereby prevented, to a certain extent, from returning by the veins, whilst the capillaries and arteries will be unnaturally distended. This state, however, will pass off after death; and venous congestion only, with extravasation, present itself. When, however, the extravasation is large, the pressure will prevent both the veins and the capillaries from receiving their due proportion of blood; whilst the ganglial system of the encephalon will be analogously, or injuriously, affected. But this topic will be pursued hereafter.

90. *D. Consecutive and complicated Apoplexy.* — An attack of apoplexy may be caused by other diseases, in various stages and states of their progress. It may occur after the pre-existing disease has disappeared, and in consequence of its disappearance, as in the case of suppressed hæmorrhages, particularly epistaxis and hæmorrhoids; or suppressed evacuations and eruptions, as those from the uterus, bowels, &c.; or it may supervene in such a way as will lead us to infer that its occurrence has been the cause of the disappearance of the pre-existing malady, as in cases of misplaced or metastatic gout, rheumatism, &c.; or it may likewise appear in the course of other diseases which it cannot thus displace, and assume the character of a most serious or fatal complication. The importance of these morbid relations of apoplexy requires for them a more particular notice than they have generally obtained.

91. *a. Consecutive.* — The supervention of apoplexy after suppressed hæmorrhages, evacuations, and eruptions, has been satisfactorily noticed by many writers; and seems to proceed from unusual fulness of the vascular system, owing to the suppression, and the accidental co-operation of causes which determine the blood to the head, and favour its extravasation. Besides the suppressed evacuations, noticed above (§ 90.) as being influential in causing an attack, I may mention the sudden healing up of chronic ulcers; the arrest of habitual perspiration from the feet; unusual continence; and suppression of the lochia or of leucorrhœa. It is not infrequently observed after suppressed ottorrhea; and from inflammation of the ear having extended to the membranes and substance of the brain, and produced abscess. I have met with several cases of this description in which the apoplectic state was complete, and attended with hemiplegia. Numerous instances are also recorded by Lallemand, Gendrin, Itard, and other writers. (See Brain, *Abscess in.*)

92. *b. Metastatic.* — The occurrence of the disease, from *misplaced* or *metastatic gout*, has been noticed by Morgagni, Weickard, Musgrave, Juncken, Tode, Hagendorn, Conradi, and Cheyne. The last named author thinks that the symptoms differ, when occurring from this cause, from those which constitute true apoplexy. I believe, however, that they differ in no respect, in general, from those which characterise congestive apoplexy; and that, as hæmorrhage within the head does not commonly constitute the attack of apoplexy from this cause, hemiplegia or paralytic symptoms seldom accompany it.*

93. Nearly similar seizures to the foregoing will occur from attacks, or metastases, of *rheumatism* to the membranes of the brain. The apoplectic symptoms are, however, seldom so fully developed as in other cases, a comatose state being the more usual result. On dissections of fatal cases of this description, Morgagni, Hoffmann, Plenciz, Ranoe, Weickard, and Stoll, found the membranes injected, thickened, and with serum interposed. Very nearly similar symptoms and appearances within the head result from *erysipelas* extending to the membranes of the encephalon. Here, as well as in the rheumatic disease of the same structures, the apoplectic state is not so strongly marked as in its more idiopathic forms; and paralysis rarely occurs, excepting in the advanced progress of the cerebral disease.

94. *c. Complications.* — Apoplexy occasionally supervenes in the course of many diseases, even at the commencement of some of them, and becomes *associated* with them. It is sometimes an attendant upon the *cold stage*, or the period of invasion, *in fevers*, particularly those which proceed from concentrated marsh effluvia, and from the infection of animal miasms. The epidemic prevalence of apoplexy, noticed by Baglivi, Lancisi, Morgagni, Formey, and Stoll, may be explained by a reference to this connection; although the observations of the Franks and Cheyne, which are conclusive of the great frequency of the disease in hot and moist seasons, seem to countenance the opinion of these authors. When apoplectic seizures usher in fevers, whether paludal or infectious, the attack is seldom accompanied or followed by paralysis. In a case, however, of perfectly formed apoplexy ushering in a case of endemic fever of a warm climate, which occurred in my practice, paralysis supervened upon the seizure. An attack of true apoplexy may also occur in the stages of depression and collapse of adynamic and typhoid fevers, particularly in the former stage: in the latter, coma is generally present, but it very rarely amounts to the true apoplectic state; and when it does, hemiplegia generally attends it.

95. The occurrence of apoplexy after *epileptic* convulsions, the convulsions and eclampsia of the puerperal state, and, more rarely, during the hysteric fit, is well known. It may even take place during the pains of labour, without previous convulsion, and in the latter months of pregnancy. In these cases the attack offers nothing to distinguish it from the first, second, or third varieties described above. It is a not infrequent termination of *inflammation* of the brain, or of its membranes. Indeed, there seems every reason to suppose that acute inflammation of that part of the cerebral structure in which hæmorrhage takes place, not infrequently precedes the extravasation. It also occasionally supervenes upon *mania*, and the various states of *insanity*, particularly in its fourth or last noticed form (§. 43.). It also occasionally arises from interrupted circulation through the *lungs*, — a fact well demonstrated by Bonet, Bang, Huxham, J. Frank, and Cheyne. Its occurrence during the advanced stages of both acute and chronic diseases of the *air-passages* and *lungs*, particularly those characterised by violent attacks of cough, has also been observed by myself, most frequently in hooping-cough, bronchitis, asthma, and emphysema of the lungs.

96. The connection which sometimes subsists between apoplexy and *organic disease* of the *heart*, especially hypertrophy of the left ventricle, has been remarked by Valsalva, Morgagni, Lieutaud, Testa, Portal, Cheyne, Richerand, Bertin, and Hope; and has been viewed by them in the light of cause and effect, the apoplectic seizure arising from the cardiac disease. Corvisart and Rochoux, physicians of large experience, have thrown doubts upon the nature of this connection; have likewise denied the frequency of its occurrence; and have viewed these diseases as sometimes consecutive in their origin, although co-existent in their advanced state, but without the relation of cause and effect: thus considering the occurrence of apoplexy or paralysis in the advanced stages of disease of the heart as entirely an accidental coincidence. But when such a complication of morbid states is frequent, prominent, and observes the same

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* Some years since I was called to a medical friend in Westminster, who, after complaining of symptoms of indigestion, was suddenly seized with complete apoplexy, with stertorous breathing, but with no signs of paralysis, for which the usual means were promptly and decidedly employed. On the following day a complete attack of gout in both feet took place, with disappearance of the cerebral disease. Warmth to the feet, and aperients, were prescribed; but from his eagerness to rid himself of the pain, and to visit his patients, he took, contrary to the advice given him, a large dose of colchicum. A few minutes afterwards the gout left his feet, and seized his stomach; whence it was with difficulty recalled to the extremities. This was the first time he had ever been seized with gout, and the first part it attacked was the brain, in as complete a form of apoplexy as can be conceived. Metastasis of gout to the head may also occasion inflammation of the brain, with coma, or lethargy.

succession, a more intimate connection than mere sequence or coincidence ought not to be entirely rejected, particularly when admitting of a rational explanation. The frequency of apoplexy or paralysis, and the general presence of the latter when the former occurs in the advanced progress of cardiac disease, especially hypertrophy of the left side of the heart, have led me to believe that more than mere coincidence actually exists. It is, however, by no means improbable that the disposition to organic change throughout the whole vascular system, sometimes associated with disease of the heart, may so far exist in the delicate vessels of the brain, as to favour the occurrence of hæmorrhage from them when the action or impulse of the heart is increased by disease or the influence of passion or emotion; or when the return of blood from the head is impeded by congestion, or interrupted circulation through the lungs or right side of the heart.

97. The association of apoplexy and *hepatic disorder* has been noticed by STOLL, BALDINGER, MOLL, CHEYNE, and others. The circumstance of icteric patients frequently being cut off by apoplexy marks the connection. I have met with several cases in which both apoplexy and paralysis have supervened to, and become complicated with, hepatitis, both acute and chronic, particularly the latter. The liver is seldom diseased without disordering the functions of the brain; and I believe that accumulations of vitiated bile in the gall-bladder and hepatic ducts, independently of any actual disease of the liver, will predispose to the apoplectic seizure. I am the more confirmed in these opinions by having observed disease of the biliary apparatus in a very large proportion of those who had died of apoplexy or paralysis; and, in many of those who have recovered, the active use of purgatives had produced morbid evacuations, containing a large quantity of blackish green, greenish, or yellowish brown bile, before much amendment had taken place. It may, however, be conceded that serious disturbance of the brain equally induces disorder of the liver; and that the latter may have been occasioned by the former. But this merely proves the frequency and intimacy of the association. It should also be kept in recollection that the apoplectic seizure generally masks the hepatic affection; the practitioner should, therefore, examine the region of the liver, where, as well as at the epigastrium, fulness, and, in some cases, the existence of tenderness, may be detected: and, as the consciousness of the patient returns, the hepatic disorder will occasionally become more manifest. This complication is so important and frequent, that it ought always to be looked for in practice; for many of the causes which occasion hepatic disorder also give rise to cerebral disease: and the production of either the one or the other singly, often favours the appearance of the other subsequently. I have no doubt, however, that an inflamed or actively congested state of the substance of the liver has a very marked effect in exciting that state of the capillary circulation of the brain on which the apoplectic seizure has been shown to depend (§88.).

98. The influence of *gastric disorder* in producing apoplexy, not merely as evinced by intoxication, a surfeit, &c., but also by some one or more of the several ailments which characterise impeded or otherwise disordered function of the stomach and intestines, has been noticed by SCHENCK, SCHROEDER, WEICKARD, MEZLER, FOTHERGILL, SCHÆFFER, THILENIUS, HUFELAND, LOUYER VILLERMAY, and CHOMEL; and more strongly insisted on by BROUSSAIS and his followers. Although the general dependence of the latter on the former has been too absolutely contended for by BROUSSAIS, the occasional connection cannot be doubted. Indeed, in several of those cases wherein the association with hepatic disorder is observed, gastric and intestinal disturbance is also evinced. But however complicated, whether with either gastric or hepatic disorders only, or with both conjoined, apoplexy is, perhaps, as often the concurrent result of the same causes that produced these disorders, as a disease springing from and dependent upon them. The fact ought not to be overlooked, that the vital manifestations of the stomach, liver, and brain, although different, are yet actuated by the same system of nerves — the ganglial; and that, notwithstanding the individual parts of this system seem to perform modified offices, yet the healthy condition of the one is necessary to the perfect functions of the rest: and, consequently, a morbid state of one considerable portion of the series will necessarily, sooner or later, be followed by derangement throughout, — causes which operate upon one part of the circle, thus having their effects extended to other parts remote from the seat of primary impression. It should not, however, be overlooked, that a large number of instances of gastric affection, retching, &c. accompanying the apoplectic seizure, proceeds from the sympathetic effect produced upon the stomach by the severe injury or shock sustained by the brain.

99. The occurrence of apoplexy either after, or during attacks of *colica pictonum*, has been noticed by HAGENDORN and CHEYNE. Although palsy is the common consequence and state of complication, yet apoplexy, with or without paralysis, particularly the former, is sometimes met with. An instance occurred to me some time since of a patient having died of apoplexy during an attack of this disease. The *constipated* state of the bowels to which persons affected with cerebral disease are liable, when neglected, or not readily yielding to medicine, will sometimes favour the occurrence of the apoplectic attack.

100. The association of apoplexy with *disease of the kidneys* has been noticed by several writers, particularly BONET, LITTRE, MORGAGNI, and BRIGHT. The occurrence of apoplexy, particularly serous apoplexy, after suppression of urine, is not uncommon. By some writers, however, the suppression has been imputed to pre-existing disease of the brain. But this is a supposition merely: for, in the great majority of cases, the kidneys and ureters offer evidence of having been the parts primarily affected. The experience of BONET and MORGAGNI, and of numerous later writers, fully support this conclusion. Besides, the cerebral nervous system can only indirectly influence the urinary secretion. That apoplexy, coma, or lethargy, should occur when the urinary secretion is suppressed, and the vascular system overloaded, may be readily imagined. The occurrence of the disease, as a consequence of organic change in the secreting structure of the kidneys, whereby their functions are more or less ob-

structed, has been illustrated by the cases recorded by Dr. BRIGHT.

101. The sudden or more gradual supervention of apoplexy after the slow developement of many of the organic changes which are described in the article on the Pathology of the BRAIN, — in some cases even when little cerebral disorder had previously been complained of; in others when more violent and even paralytic symptoms had occurred, has already been noticed (§ 45—48.), and has also received due attention in the article on PALSY.

102. THE PATHOLOGICAL STATES CONSTITUTING APOPLEXY have been in part comprised in the observations offered on the principal kinds of apoplectic seizure, and on the *modus operandi* of the remote causes (§ 88.). There can be no doubt that much misapprehension has existed on this subject, and consequently that the treatment adopted has been frequently either nugatory or injurious. The opinion, that the disease depends upon compression solely, has been too generally adopted, without considering the relation in which such compression, granting its existence, stands in to the causes which occasioned it, and the symptoms it produces. The idea that compression is indispensable to the existence of the disease has thus been empirically assumed, and acted upon in practice. A careful consideration, however, of the morbid appearances on dissection, in relation to the symptoms, and to analogous changes and their phenomena, have led me to infer that compression of the brain never can take place; that *pressure* exists in the great majority of cases, but even that it is not indispensable to the apoplectic state; and that, although *retarded* circulation, whether caused by pressure or by any other state, seems very frequently to obtain, it does not constitute the only morbid condition of the brain in apoplexy, — or, in other words, that apoplexy is not merely a disease of the vessels of the brain, although these vessels are either consecutively or coetaneously affected. It should not, however, be overlooked, that even those who argue for compression being the cause, do not thereby imply, as their opponents would make it appear, that the tissue of the brain is actually compressible, but contend for the effects which pressure undoubtedly produces upon living and sensible parts. Therefore, although the brain is not compressible, it does not follow that it may not be affected by *pressure*, even independently of the obvious effects which pressure must produce on its vessels and the circulation through them.

103. Before entering further on this subject, it will be necessary to premise, that the circulation of the brain, like that of other important organs, is chiefly under the dominion of that portion of the ganglial system of nerves which is ramified on its blood-vessels, and is distributed otherwise to the organ itself; and that an exhausted or morbidly depressed state of the influence those nerves exert on the circulation and manifestations of the brain, with the consequent effect this state has upon the capillaries, particularly in dilating or congesting them, and disposing to their rupture, is the principal cause of, and often constitutes, the apoplectic seizure, — whether this influence emanate from their chief centres, or from the local sources provided for the peculiar offices of the organ, as the pineal and pituitary glands.

104. From this it may be inferred, that the proximate cause of a large proportion of the cases of apoplexy, not omitting even those which are attended with retarded circulation and hæmorrhage, is here imputed primarily to the condition of that part of the ganglial system which supplies the blood-vessels of the brain and the brain itself. That this actually is the case, is shown by the nature and mode of operation of the remote causes of the disease; by the frequent affection of the functions of the brain previous to an attack; by the nature of the principal part of the phenomena accompanying the attack; by the disorders observed subsequently, when partial recovery takes place; by the tendency to relapse; and by the morbid appearances which present themselves on the dissection of fatal cases.

105. It is obvious, that the appearances in these cases are merely ultimate lesions, as in all fatal cases of *organic disease*, and some of them even post mortem changes; and yet, although the most advanced in the procession of morbid phenomena, they are often of themselves obviously insufficient to occasion death. Leaving out of question those cases which are unattended with extravasation, the venous congestions, even admitting their existence, or the serous effusion, formed in the other cases, are seldom such as to account of themselves for the event: inasmuch as they are frequently observed to an equal, or even greater, extent in cases where neither apoplectic nor comatose symptoms had preceded death; and are, as I have already shown (§ 88.), the result of the accumulation in the veins, after death, of the blood which had distended the arterial capillaries during life, and thus had been instrumental in abolishing the cerebral functions.

106. The circumstance of the morbid changes being insufficient to account for the result, had induced various writers, particularly KORTUM, ZULIANI, SCHELLER, SCHÆFFER, and HUFELAND, to consider apoplexy frequently to proceed from the state of the nervous power, which they considered defective; and led WEICKARD to contend that it seldom depends upon compression. Dr. ABERCROMBIE, evidently influenced by the above considerations, refers the disease to *interrupted* circulation in the vessels of the brain, owing to pressure from the effused blood, or to other causes. It is extremely probable that a *retarded*, if not an interrupted, state of the circulation very generally obtains; and that, partly in consequence, the sensific and motific powers are not generated. This, however, is only a matter of inference; for we have no evidence that complete interruption of the circulation of an organ or part can exist for any time, and its functions be so rapidly restored, as is sometimes observed in apoplectic seizures, or without gangrenous disorganisation being sometimes the result; and even if we admit this state of the circulation, we must still refer it to some antecedent and more general morbid condition.

107. That a congested state of the vessels and retarded circulation of the brain should, however, exist, owing to the diminished, or exhausted, or suppressed state of that influence which undoubtedly actuates the vessels, may readily be conceded; but that, even in the brain, the effusion of a small portion of blood should occasion pressure sufficient to *interrupt* the circulation through it, requires

further proof. It seems more probable, and consonant with facts observed in other parts of the body, that, in cases where the extent of effusion or external injury warrant the admission of pressure, this state gives rise to the apoplectic seizure, as much from the effects it produces upon the ganglial apparatus of the encephalon as from *interrupted* circulation through its vessels.

108. THE PATHOLOGICAL CONDITION OF THE BRAIN, therefore, in apoplexies, may be stated to be as follows: — *a.* That the tissue of the brain is not sensibly *compressible;* but, being lodged in an unyielding case, it may be injuriously affected by *pressure,* chiefly by displacing the contents of its blood vessels, altering the healthy relative proportion of their contents in each of the series of vessels, and impeding the circulation through a part or the whole of the organ: and that pressure exerted in one part, whether from distended vessels, extravasated blood, or the developement of tumours, when reaching a certain pitch, will almost equally affect the whole of the organ, particularly when the pressure is great: the yielding nature of the cerebral structure, as well as the unyielding case in which it is placed, must necessarily give rise to this result.

109. *b.* The various states of vascular impulse and action, impeded circulation in the veins and sinuses of the brain, and distension of its capillaries, whether arising from the influence of the organic nerves on the blood vessels, or from morbidly increased action, or from obstruction in the large veins, the lungs, or the right side of the heart, will, either individually or in partial conjunction, occasion the above effects, owing chiefly to the unyielding walls of the encephalon.

110. *c.* Owing also to this physical condition of the brain, the pressure of the atmosphere, which influences the venous circulation of all other parts of the body, cannot modify, in a direct or sensible manner, that of the brain: and hence the cranial cavity must always contain nearly the same quantity of blood during life, the differences which occur being chiefly those of rapidity of circulation, and of relative proportion in each part of the series of vessels; an increased quantity in the capillaries thus causing a proportionate diminution in the veins. Owing likewise to this condition, the forcible injection and distension of one set of vessels will necessarily diminish the capacity of, and obstruct the circulation through, the other; and that part of the series which is nearest to the propelling power — the first to receive the impulse of the heart, and the nearest capable of being much distended by it — will, from relative situation, overcome the distension, and diminish the capacity of that beyond it. Thus the arterial capillaries of the brain will be the first distended from increased action of the heart and large arteries, and, by their distension, will soon overcome that of the veins, if it have previously existed; and hence, by compressing them, impede the circulation through them.

111. The frequent *inflammatory character* of apoplexy, or the common occurrence of *reaction,* will be readily accounted for from what has now been stated; for, whether the attack commences with dilatation or increased action of the arterial capillaries, or with exhaustion or deficiency of their vital power, or with retardation of the circulation through the veins and venous capillaries, the result will generally be augmented action of the arteries going to the brain, extending itself in some measure to the heart, and this state will continue until the abolition of the cerebral functions shall have impaired, or altogether destroyed, the heart's action.

112. *d.* Upon tracing the relation subsisting between the various causes of the disease, the symptoms, and the appearances on dissection — upon remarking, as far as my own observation has gone, the frequency of change in the pineal and pituitary glands of apoplectic patients, I am induced to infer that functional lesion, or organic change, often commences in that portion of the ganglial system which supplies the encephalon and its blood vessels; and that, owing to exhaustion of its influence, the capillaries lose their vital tone, have their circulating functions impaired, become more or less dilated, and are disposed to rupture.

113. *e.* When apoplexy proceeds from causes of an obviously *exciting nature,* or from *sur-action* of the heart and arteries, it seldom occurs until a certain degree of exhaustion of the vital tone of the capillaries has taken place, whereby they become dilated and congested, so as either to press the encephalon against its unyielding case, and, owing to the pressure, impede the return of blood by the veins (§ 109, 110.), or to give rise to extravasation, which, when considerable, has a similar effect; injection of the arteries of the brain and its membranes resulting equally from both, owing to the obstructed circulation through the veins.

114. *f.* Where pressure unequivocally exists, it may also benumb or suppress the vital influence of that part of the ganglial system which supplies the encephalon, thereby heightening the effect produced both on the organ itself and on its circulation.

115. *g.* There are cases of apoplexy generally presenting the phenomena, which have given rise to the appellation of *weak apoplexy,* which, occurring from *depressing causes,* operating upon exhausted states of the encephalon and frame generally, directly suppress or abolish the vital influence of the organic or ganglial nerves of the brain, and consequently the cerebral functions, without producing further change of its vascular system, than retarded circulation to so slight a degree, as not to amount to great distension and compression, and without occasioning extravasation of blood, although extravasation often does supervene to this state, giving rise to pressure and its consequences, so as to heighten or prolong the primary lesion, and to occasion paralysis.

116. *h.* In cases proceeding from *depressing causes,* acting on a plethoric habit of body, the effect is also more or less directly produced on the organic nerves of the brain, whereby the capillaries lose their tone, are congested and dilated, or ultimately ruptured, and the return of blood by the veins retarded, whilst the smaller arteries and capillaries are more and more engorged by the impetus of the blood in the large arteries, the pressure thereby occasioned suppressing the cerebral functions as in the other cases.

117. *i.* When the disease proceeds primarily from *impeded return* of the blood from the head, the congestion only commences in the veins; but, as the action of the heart and arteries con-

tinues, the capillaries are soon afterwards injected and dilated; and, in proportion as they enlarge from the distending power to which they are more immediately subject, the veins are compressed, owing to the physical condition of the brain, more or less emptied, and admit of the greater dilatation of the capillaries, some one or more of which may be even ruptured from the increased action and distension.

118. *k.* In cases accompanied with *hæmorrhage*, and consequent laceration of the cerebral structure, the deprivation of function may be as much an effect of suppression of the vital influence of the organ, owing to the shock produced by the injury, as of pressure upon the veins, and consequent injection of the arterial capillaries. In cases of this description, the state described above (§ 112. *d.*) may exist, and be followed by hæmorrhage and laceration of the part in which it occurs, producing the abolition of the cerebral function, great vital depression, sickness, and other signs of dangerous injury sustained by a vital organ. The pressure occasioned by the hæmorrhage will be followed by obstructed circulation, and, under favourable circumstances, by increased action of the arteries and heart to overcome it.

119. *l.* In apoplexy presenting on dissection *congestion* and serous effusion, these states may be often considered rather in the light of *post mortem* changes than the pathological states which had existed previously to death: it may even be presumed that the distension and congestion of the capillaries, chiefly the arterial capillaries of the organ, had overpowered its functions; and that, as in other parts, when the injection of the blood into them no longer is continued, and the distending cause has ceased to exist, they have gradually discharged their contents into the veins, which now had space given them for dilatation, owing to the emptying of the capillaries; and thus the blood has passed into the veins soon after death.

120. *m.* Hæmorrhage in the brain may result from the following states: — *α.* Exhausted vital energy of the ganglial organic nerves supplying the vessels and organ favouring their distension and rupture: *β.* Diseased state of the coats of the vessels themselves: *γ.* Organic change of the cerebral structure, extending to, or influencing the state of, the vessels ramified in it: *δ.* Increased impetus of blood from augmented action of the heart and larger arteries, combined with either of the other states: *ε.* Impeded return of the blood from the head, similarly associated.

121. *n.* The vital energy of the organ, resulting chiefly from the mutual influence of the ganglial and vascular systems, may be so far affected as to occasion the attack with all the organic changes observed in fatal cases; and sometimes in such a manner as to constitute the disease, even without these changes having taken place; although they are most frequently produced, thereby heightening the primary lesion.

122. *o.* As corollaries from the foregoing, I infer that apoplexy often originates in exhausted or suppressed influence of the ganglial apparatus of the encephalon, with a congested state of its arterial capillaries, or impaired condition of their circulating functions, and still more frequently in extravasation of blood, either or all of which changes must necessarily exist to the extent of suppressing the functions of the organ; and that, as apoplexy does not uniformly depend upon the same pathological state of the nervous influence and circulation of the brain, particularly in respect of the kind or degree of vital depression and vascular reaction, a due regard ought therefore to be had to the nature of the change in each case, as far as it may be ascertained, and a treatment strictly appropriated to it adopted.

123. TREATMENT. — The treatment of apoplexy has long furnished subjects for discussion, not only as respects the more subordinate means of cure, but also as regards the most energetic measures, and the intentions with which they should be employed. This is evidently owing to the difference which has been long acknowledged to exist in the pathological states constituting the disease, but which has recently been questioned. Without recurring to the changes so fully described above, I may remark, that a person is seized with apoplexy, and, instead of being blooded, is treated with stimulants and restoratives, and yet he recovers without paralysis having supervened. Another person is blooded largely, and he recovers. A third is treated in a similar manner, and he becomes hemiplegic in the course of the attack; and a fourth is also blooded, and he dies. Now these are very common occurrences, and point to very important considerations, which I will pursue a little further. A thin, spare, and debilitated man staggers as he walks, and falls down in the street, with pale countenance, feeble pulse, and laborious or slightly stertorous breathing. He is blooded by the nearest medical man almost immediately, and recovers. A large man, of a full habit and lax fibre, suddenly becomes apoplectic, and is instantly treated with stimulants, and volatile substances held to the nostrils, and his consciousness and voluntary motion are restored in a few minutes. One practitioner of large experience states, that he never draws blood from a patient in apoplexy, excepting under peculiar circumstances, and avers that he is more successful in his treatment than those who do. Another considers that when one full blood-letting fails of giving relief, no benefit will be derived from pushing it further, but much risk of giving rise to paralysis. A third physician, equally eminent and experienced, confides in blood-letting almost solely, and carries it often to a great amount; and a fourth, whilst he discards depletion, trusts to stimulants chiefly.

124. But if we examine into their success, we shall find, perhaps, that some difference as to degree may exist; and that, whilst many patients seem benefited, others experience no relief, if they be not even actually injured, by the kind of practice thus exclusively adopted. There is, however, one part of the treatment which is more or less adopted by all: this is the use of purgatives; which, when judiciously administered, are the most generally applicable and beneficial of all the means usually advised. Were it possible to ascertain during life the exact pathological condition obtaining in the various cases of apoplexy, and to convey a correct description of the signs by which each may be known, then the basis for a rational method of cure could be firmly laid: but the skilful practitioner is guided in the treatment he adopts by considerations, circumstances, and appearances, which scarcely admit of de-

scription; and all attempts to impart his knowledge comes far short of his wishes.

125. The method of cure in apoplexy necessarily divides itself into: — 1st, That which is required when an attack is threatened, in order to prevent it, — or the prophylactic treatment; 2d, The means which are to be adopted when the disease is developed; and, 3d, The plan which should be subsequently pursued, with the view of perfecting recovery, and preventing a return of the disease, — or the consecutive treatment.

126. *A.* THE TREATMENT WHICH MAY BE EMPLOYED TO PREVENT AN ATTACK WHEN IT IS THREATENED. — It is difficult to state the means which may be resorted to with this view, as they ought to be directed with strict reference to the circumstances of the case; which are almost always different, and, not infrequently, even opposite. A strict regard must necessarily be had to the habits, age, and constitution of the patient; the predisposing and exciting causes; and the evidences of previous ailment or existing disorder in remote but related organs. The character of the countenance; the pulse, particularly in the carotids; the temperature of the head; the state of the abdominal functions, secretions, and discharges, must be our chief guides. It should not be overlooked in this stage, any more than when the disease is fully formed, that it may result from nearly opposite states of the vascular action of the brain, and of the circulating system generally; that, although the majority of cases are attended with that appearance of countenance, and action of the arteries, which warrant the inference of existing congestion, retarded circulation, or even increased vascular action in the brain, — there are others, in which the external characters of the head, the face, and action of the carotids, would lead us to infer, either that the vital energy of the organ is so far depressed as to give rise of itself to abolition of the cerebral functions, or that the extravasation of blood and laceration of the structure of the organ has occasioned such a shock to its vitality as to be followed by the same effect on its functions; vascular reaction sometimes supervening in either case, and thus imparting to the attack similar characters to those possessed by seizures which originate in, or are, from their commencement, attended with, vascular turgescence or increased action.

127. In the premonitory state of the disease, it scarcely can be admitted that extravasation or its consequences has occurred, unless in those cases preceded by paralysis; but the signs of incipient congestion, or increased action, are frequently present; whilst also, in many other cases, the symptoms of exhausted or depressed vital power are manifest; this latter state being more frequently antecedent to congestion of the capillaries than is generally supposed, although the fully formed disease may evince inordinate action, with all its usual consequences. Even in the early stage of an attack, this state of the vital power of the organ will often constitute so important a part of the disease, and will yet be attended only by simple congestion and retardation of the circulation, that the use of stimulants may then be beneficially resorted to; whilst soon afterwards, when reaction has supervened, they would no longer be admissible, large depletions, &c. being then required.

128. We should, therefore, endeavour to interpret correctly the origin of the premonitory symptoms, and prescribe accordingly. If the countenance is full or flushed, the eyes prominent or suffused, the pulse of the carotids full or strong; or even if, with this state of the countenance, they are natural; *blood-letting*, general or local, but preferably cupping on the nape of the neck, should be prescribed. If these symptoms have come on after the disappearance of hæmorrhages and discharges, this treatment is still more imperatively required, and should be directed to the restoration of the pre-existing disorder, assisted by other means, such as irritating purgatives, *revulsants*, and external derivatives.

129. When, on the other hand, the action of the carotids is weaker than natural, the countenance sunk, and the head cool, &c., opposite measures are called for: *restoratives*, antispasmodics, and stimulants are here of service, but their use requires caution; for if the pulse in the carotids is full, or strong, or at all above the natural standard, although the countenance be sunk or pale, and if the attack threatens to commence with paralysis, stimulants given internally, or even the outward use of them, as volatile substances held to the nostrils, would be hurtful. In such cases, blood-letting must be resorted to; and a *purgative* of quick operation, assisted by enemata, exhibited.

130. There are few cases, presenting even the premonitory signs of an attack, that will not be benefited by a judicious use of *purgatives*, particularly such as are suited to existing disorder of the digestive and biliary organs. In those cases which evince a disposition to vascular excitement of the brain, — where the premonitory signs are accompanied with plethora, heat of the head, injection of the conjunctiva, and flushed countenance, — after depletions and purgatives have been resorted to, the tartrate of antimony, or *James's powder*, given in moderate doses, and combined with saline medicines, so as to act gently upon the skin or the bowels, and continued for some time, has always appeared to me productive of advantage: but it is only in such cases that antimony is useful as a prophylactic; where, also, *digitalis* may be given with the view of lowering the action; but its use in these cases requires great caution.

131. When the incipient symptoms present much of the character of vital exhaustion of the brain, the combination of purgatives with gentle *stimuli* and *vegetable tonics* and stomachics has proved the most successful in my practice. If the symptoms appear after the suppression of hæmorrhoids, *aloetic* cathartics, or the extract of *colocynth*, combined with *calomel*, are amongst the best that can be employed; as they tend to induce, by their action on the rectum, a return of the hæmorrhoidal affection.

132. In threatened apoplexy from congestion and impeded circulation through the lungs, heart, or liver, local blood-lettings and purgatives are necessary. In cases characterised by a combination of either of these states with exhaustion or debility, the abstraction of a small quantity of blood by cupping, and afterwards dry-cupping, issues, or blisters, are sometimes very serviceable.

133. The insertion of setons or issues in the

nape of the neck, or the use of the tartar emetic ointment; and, in very urgent cases, large issues in the scalp of the occiput, particularly when the precursory symptoms evince a paralytic character; cold-sponging the head night and morning, or the shower-bath, with a free state of the alvine secretions and excretions, especially where there is a disposition to congestion, or increased action in the brain, and after blood-letting has been employed; stimulating or irritating pediluvia, or a blister applied to the nape of the neck, and kept open for some time, in similar cases and preceded by the same measures, constitute important items of the preservative treatment.

134. The patient ought carefully to avoid all the predisposing and exciting causes of the disease (§ 77—87.), particularly crowded apartments, the application of cold to the feet, and violent mental emotions. He ought to sleep with his head and shoulders somewhat elevated; and rise early in the morning. The *diet* should receive particular attention: it ought to be spare in all cases accompanied with plethora; but not too low, when this state of the vascular system does not exist, and when the vital energies of the brain are already depressed or exhausted. It should, in these latter, be of moderate quantity, and digestible. In all cases, tranquillity of mind and body ought to be carefully preserved; and stimulating beverages avoided, with very few exceptions, which are to be made in favour of those only who present great cerebral and constitutional exhaustion. The beverages for these should be gently strengthening, but not heating, and used in moderation.

135. *B.* The Treatment of the Apoplectic Attack. — The patient should be carried into a well-ventilated and spacious apartment, and placed with his head and shoulders very considerably raised, or in a sitting or semi-recumbent posture, with every thing removed from his neck. Directions should also be given to have hot water in readiness. His countenance, state of the eyes and pupils, the degree of fulness, flushing, or pallor of his face, the temperature of his head, state of the pulse in the carotids, and condition of his limbs in respect of sensibility, capability of motion upon their being pinched, &c. ought to be carefully examined; and, according to the evidence thus obtained as to the state of internal lesion, the propriety of depletion, and the extent to which it is to be carried, should be promptly decided on.

136. *a. Treatment of apoplexy unattended by depression of vascular action, or by marked exhaustion of vital power.* — If the pulse be strong, or full, and especially if the countenance be flushed, livid, and tumid, *general blood-letting* to a large extent, or according to its effect, is to be instantly employed. Much discussion has taken place as to the propriety of opening a vein of the paralysed or non-paralysed side, when paralysis accompanies the attack. Aretæus, Valsalva, Morgagni, and Cullen advise it to be performed in the sound side, whilst Baglivi prefers the other: this is, however, a matter of little importance.

137. The next points are the *extent* to which blood-letting may be carried, and how far certain states of the frame and pulse warrant the practice. In robust, plethoric, and full-living persons, particularly when the attack has proceeded from exciting causes, and paralysis is not present, thirty or forty ounces may be abstracted at once; and the operation may be performed a second or even third time to a somewhat less extent. When, however, the habit of body is spare, the person far advanced in life, the pulse not full or strong, or little fuller than natural, the heat of the head not increased, and the countenance neither full nor flushed, we must be cautious not to carry it too far. In cases of this kind, *local depletions*, particularly *cupping* between the shoulders, or on the occiput, and leeches to the neck and behind the ears, seem preferable. *Age* is no reason against venesection, if the symptoms indicate its propriety; but very old age, even when the operation is otherwise indicated, is a strong reason for great caution in its performance. In aged persons, local depletions are more serviceable; but even these, employed either indiscriminately or too largely, may occasion a very dangerous, or even fatal, collapse.

138. An *intermitting* or *irregular* pulse has very justly led practitioners to hesitate as to the employment of blood-letting. But a single symptom is not to guide us in the use of this, or any other remedy. If, conjoined to either of these states, there be slowness or fulness of pulse, stertorous or strong breathing, constitutional vigour and fulness of habit, tumid, flushed, or livid countenance, blood-letting, even to a very considerable extent — either general or local, or both — may be practised; but when, with irregularity and intermission, the pulse is also small, weak, or quick, the countenance pale, the temperature of the head either not increased, or somewhat depressed, and the respiration weak rather than strong, blood-letting would be highly injurious: a very opposite treatment is then called for.

139. In cases where it is a matter of doubt whether or not general blood-letting should be carried further, or be adopted at all, *local blood-letting*, to an extent which circumstances will point out, may generally be still employed, and often with great advantage. Vascular depletion being indicated in one form or other, the *situation* in which it should be performed next remains to be considered. The temporal artery has been recommended to be opened by some: others advise the jugular vein. When the disease arises from congestion, and when the face is livid, the attack strong, and the operator expert, the jugular vein may be opened, as sanctioned by Valsalva, Morgagni, Hiester, Friend, Lancisi, Stoll, Burseri, and Portal. But undue pressure of the vein, either before or after the operation, must be avoided. Bleeding from the feet, they being plunged in warm water, has been very generally prescribed by Continental physicians; and, in those cases which have occurred after the disappearance or retention of hæmorrhages and periodical discharges, or from metastasis, the practice is very judicious.

140. *Local depletions* in this disease are usually directed on the temples, nape of the neck, or between the shoulders. I prefer the latter situation, as well as cupping, to the use of leeches, — the former being much quicker and more decided in its operation. Hippocrates, Aretæus, and Morgagni advised cupping to be performed on the occiput: and I unequivocally agree in the

practice. If leeches are applied, the neck, occiput, and behind the ears, are the best situations. LANCISI and CRUVEILHIER advise them to the inside of the nostrils, after general blood-letting, particularly in apoplexy preceded by opistaxis; and WALTHER (*De Apop.*, p. 88.), to the veins near the canthus of the eye. In cases of suppressed hæmorrhoids or menses, the application of leeches to the anus, the anterior part of the insides of the thighs, particularly after blood-letting from the feet, certainly is frequently productive of advantage, even although it very often fails of restoring the suppressed evacuation.

141. Some physicians rely almost entirely on blood-letting, whilst others too frequently discard it. Others more rationally view it as a most important, and a frequently, but not an universally required remedy. It is by not attending to the pathological states, which I have endeavoured to point out (§ 108—122.)., and to the changes of vascular action which take place during the attack, that such difference of opinion exists, and the indiscriminating practitioner is led to the injurious adoption of one mode of practice only. Among those who prescribe blood-letting almost unreservedly, and to a great extent, I may adduce the respected authorities of CULLEN, CHEYNE, PITCAIRN, COOKE, and ABERCROMBIE; whilst the injurious effects of the practice in many cases, and its applicability to certain states of the disease only, have been ably argued for by KIRKLAND, FOTHERGILL, HEBERDEN, BARBETTE, and DARWIN. There can, however, be no doubt of the propriety of having recourse to vascular depletion in the states of apoplexy now under consideration, — the general character of the symptoms, circumstances of the case, and the effects produced by the first bleedings, being our chief guides as to the extent to which it should be practised. But in the forms of apoplexy characterised by marked deficiency of vital power and action, or sometimes at the commencement of the seizure, when the symptoms, owing to the severe shock sustained by the brain, very closely resemble those of concussion, and before the powers of life recover themselves, and react (§111.), blood-letting would generally be attended either with fatal sinking, or with effusion, giving rise to hemiplegia where effusion had, as yet, not taken place, and with a fatal increase of it, in some where it had already existed.

142. Next to blood-letting, *active purgatives* are most deserving of notice, as being very generally applicable and beneficial. In many of the most severe and sudden attacks it is often difficult, and sometimes impossible, to administer purgatives in the usual form by the mouth. But we may always succeed by mixing from 10 to15 grains of calomel in sweet butter, and placing it upon the root of the tongue. In some cases, two or three grains of powdered camboge may be added to it.

143. Whilst we are waiting the operation of the purgative, it will frequently be advisable, particularly when there is much heat of head, and action of the carotids, to plunge the feet and legs in warm water, and apply *cold to the head*, either in the form of *affusion* of cold water, or of epithem. Great care is necessary not to continue affusion too long, nor to depress the temperature too low, as the risk of inducing hemiplegia will be increased by the practice, particularly when vascular action is not considerable. After the affusion has depressed the temperature to about the natural standard, cold lotions or epithems, or even frequent cold-sponging, will be sufficient; but increased heat generally returns, and then the affusion should be again resorted to. In general, as soon as the temperature of the head becomes natural, and continues so for some time, and the fulness of the features entirely subsides, cold applications may be omitted. As thus used, they have received the sanction of THILENIUS, CRELL, WEICKARD, CARRETTE, WEBER, and ABERCROMBIE; but QUARIN very judiciously cautions against the indiscriminate and too long continued use of them. CRUVEILHIER, and other French physicians, advise the application of *ice* for an hour or two, twice or thrice a day, to the head; but, excepting in the more inflammatory states of the disease, it is not required, and may even be attended with risk.

144. If the purgative already exhibited does not operate in about four hours, one or two drops of *croton oil* should be placed upon the tongue, mixed with a few drops of castor oil, or in a little sweet butter, as advised above; and, about an hour afterwards, the action on the bowels ought to be promoted by the following enema: —

No. 20. ℞ Olei Ricini, Ol. Terebinth., āā ℥j. — ℥jss.; Decoct. Avenæ, ℥xij. M. Fiat Enema.

This will generally succeed; but if it come away without feculent or copious evacuations, it should be repeated in from one to six hours, according to the extent of its effect. In obstinate cases, one part of croton oil added to about eight or ten of castor oil may be assiduously rubbed over the abdomen. This, however, will seldom be requisite, as a repetition of the enema will rarely fail, and will act more beneficially on the disease than the introduction of so irritating a substance as croton oil into the circulation. In some cases it may be advisable to render the enemata more irritating by the addition of compound extract of colocynth. Irritating injections are enjoined by ARETÆUS, FORESTUS, and many modern authors, particularly THILENIUS. In cases following hæmorrhoids, they are more especially indicated, after leeches have been applied to the vicinity of the anus.

145. After the bowels have been fully evacuated, we must still endeavour to excite the alvine secretions, particularly those of the liver. The region of the liver and epigastrium should be examined: and, if there be fulness there, cupping may be performed in this situation. The calomel may be repeated in smaller doses, oftener than once, and combined with some *preparation of antimony*, or James's powder. In all cases where the apoplectic seizure is attended with increased vascular action, antimony may be given; but sickness or retching should be guarded against. It will be frequently observed that a repetition of the calomel, particularly after full depletions, will be soon followed by a flabby state of the tongue, indicating its incipient action on the mouth, and the propriety of omitting it, and of continuing the purgatives. It is frequently not till now, particularly where the apoplectic seizure has been preceded by much torpor of the liver, and accumulations of viscid bile in the gall-bladder and hepatic ducts, that the purgatives succeed in bringing away, dark, greenish black, of-

fensive motions, the discharge of which is generally followed, in robust subjects, by rapid amendment.

146. When the disease is attended with *hemiplegia*, or when the paralysis appears in the course of the attack, we may generally presume that extravasation has taken place. In these cases very large or repeated depletions will not much accelerate the removal of the effusion; this is a work of time. The object rather is to arrest the hæmorrhage by the operation; but even this will not be so readily accomplished, owing to the physical condition of the organ. Indeed, if the depletion be carried beyond a certain extent, in relation to the peculiarities of the case, the risk of renewing the hæmorrhage will even be increased; for, as we cannot, as already stated, materially diminish the quantity of blood in the brain, we only accelerate its circulation by large depletions, and thereby risk an increase of the mischief. On this account, therefore, the intentions with which blood-letting is to be employed, are, 1st, to arrest the hæmorrhage, and 2d, to diminish or keep down the action of the heart and arteries: but, although essentially requisite in the majority of cases, full blood-letting will be of itself insufficient to accomplish these purposes; and we have therefore to bring to its aid the application of cold to the head, active purgatives, derivatives, and a judicious combination of antimonials and cooling saline medicines, which ought always to be exhibited at short intervals, and continued for some time during convalescence; two or three grains of blue pill being also taken at bed-time, and an aperient draught the following morning. Any of the following saline medicines may be employed when we wish to lower the action of the heart or arteries of the brain: —

No. 21. ℞ Vini Antimonii Tart. ♏ xvj. — ʒ ss.; Liq. Ammon. Acet. ʒ ijss.; Potassæ Nitratis gr. v.—x.; Aquæ Puræ ʒ x.; Syrup. Croci ʒ ss. M. Fiat Haustus, tertiâ vel quartâ quâque horâ sumendus.

No. 22. ℞ Potassæ Sub-carbon. ʒ j.; Succi Limon. recent. ℥ jss. vel q. s.; Aq. Fœniculi ℥ iij.; Vini Antimonii Tart. ʒ ij.—ʒ iij.; Syrup. Tolutan. ʒ ij. M. Fiat Mist. cujus sumantur cochlearia duo larga secundâ vel tertiâ quâque horâ.

No. 23. ℞ Potassæ Nitratis gr. x.; Aq. Cinnamomi ℥ j.; Liq. Ammon. Acet. ʒ ijss.; Spirit. Æther. Nit. ʒ ss.; Syrup. Limonis ʒ ss. M. Fiat Haustus, tertiis horis capiendus.

147. When the measures stated above leave considerable exhaustion, and particularly if accompanied with sopor, weak action of the carotids, a cool state of the head, and unperspirable surface, it will generally be necessary to venture upon the use of very gently restorative and diaphoretic medicines. These ought, however, to be cautiously commenced with; and, when we have reason to infer that the attack has proceeded from extravasation, which is most frequently the case, we should carefully watch their effect, or delay them until after the twelfth or fourteenth day from the seizure. Inflammatory action in the surrounding portion of brain, consequent upon the extravasation, usually supervenes from the fifth to the fourteenth day. During this time, therefore, perfect quietude of body, stillness, and silence, and disengagement of the senses and mental faculties, should be enjoined, and febrifuge medicines prescribed, in order to suppress local action, and the consequent fever which often manifests itself at this period. The patient should be either kept in bed, or on a couch, with his head and shoulders well elevated; and visiters ought not to be admitted to him. The eighth day is generally the most dangerous, as respects either a renewal of the hæmorrhage, in the immediate vicinity or surface of the parietes of the hæmorrhagic cavity, or in a different part of the brain, or the occurrence of serous effusion between the membranes or in the ventricles. During the first days, therefore, of the attack, we should only venture on the more gentle febrifuge diaphoretics; and after the second or third week, somewhat more restorative means may be employed, if the state of the vital energies requires them. The following may be resorted to in the order in which they are placed: —

No. 24. ℞ Potassæ Nitratis gr. v.—vij.; Mist. Camphoræ, Aq. Fœniculi, āā ʒ ivss.; Liq. Ammon. Acet. ʒ ij.—ʒ iij.; Spirit. Æther. Nit. ʒ ss.; Syrup. Limonis ʒ ss. M. Fiat Haustus, quartâ quâque horâ sumendus.

No. 25. R Vini Antimonii ♏ xii.—xx.; Mist. Camphoræ ʒ iij.; Aq. Cinnamomi ℥ ss.; Liq. Ammon. Acet. ʒ iij.; Syrup. Aurantii ʒ j. M. Fiat Haustus, quartâ vel quintâ quâque horâ capiendus.

No. 26. ℞ Mist. Camphoræ ℥ j.; Liq. Ammon. Acet. ʒ ijss.; Spirit. Ammon. Arom. ♏ xx.—ʒ ss.; Syrup. Tolutan. ʒ j. M. Fiat Haustus.

No. 27. ℞ Infus. Calumbæ (vel. Infus. Valerianæ), Mist. Camphoræ, āā ʒ v.; Sodæ Sub-carbon. gr. x.; Spirit. Æther. Sulphur. Comp. ʒ j. M. Fiat Haustus, bis terve in die sumendus.

Before I proceed further, in noticing the other remedies which may be resorted to, or have been recommended, I will state the means which are most appropriate to the weaker states of the disease, and when the system is greatly depressed by the shock of the local lesion, or before increased action has taken place.

148. *b. Treatment of the depressed states of apoplectic seizures.* — It will be apparent from the particular details I have given of the symptoms, causes, and pathological states of the disease — 1st, That much depression or exhaustion of the vital powers of the brain exists in some cases throughout the attack, even rapidly terminating in death without any effort at vascular reaction, particularly when this state is mistaken, and treated by depressing remedies; and, 2d, That this depression is often analogous to concussion of the brain, owing to the extent of the local lesion; and, like this result of external injury, is frequently followed by reaction of the heart and arteries (§111—118.), when the lesion constituting the seizure is not so great as to overwhelm the powers of life.

149. It is owing, in my opinion, either to the employment of too large blood-lettings in such cases, to the having recourse to them at all in others, or to practising them without sufficient regard to this period of the seizure, and before the occurrence of reaction, — the time when they are imperatively called for, — has supervened, that the practice has disappointed many who have adopted it, and led others to employ an opposite mode of treatment in an equally exclusive, and hence dangerous, manner. The judicious use of *gentle stimuli* during this state of depression will have the effect in some cases of bringing about a moderate reaction, when death would be the result of other means; and, by diminishing and shortening the stage of depression in others, and thereby lessening the congestion of the capillaries of the brain, that inordinate degree of arterial action consequent upon the obstruction, and indirectly produced by it, will be prevented. In some more doubtful cases, as when the pallor of the countenance is connected with a natural, or

not very depressed state of the pulse, and temperature of the head, and when there are vomiting and other symptoms, indicating that hæmorrhage and laceration of a portion of the cerebral structure have occurred, blood-letting may be advantageously conjoined with cordial remedies, calculated to restore the tonic contractility of the vessels of the brain.

150. It will appear from what has been stated, that those who deny the efficacy of blood-letting are in some respects justified by the frequent deficient vital energy of the brain, and by the injurious effects of the remedy in some cases, whilst they err in a too general recommendation of opposite means. Both parties, however, place great dependence upon active purgatives, and I believe that much of the success obtained by the abettors of both modes of practice is to be ascribed to them.

151. In apoplectic cases, therefore, with signs of deficient vital energy of the brain and constitution, — and, when we refer to our experience, or consider the nature of many of the exciting causes, as well as the very far advanced ages of the great majority of apoplectic patients, the number of such cases will appear by no means small, — and at the commencement of some seizures, before reaction has supervened, when the countenance is pallid or sunk, the pulse of the carotids weak or small, the temperature of the head not increased, and profound sopor, rather than very stertorous or strong breathing, is present, gentle restoratives, administered either internally or externally, are the most serviceable.* The propriety, then, of attending to the fact, that apoplexy often is *originally* dependent upon the state of the sensorium — upon the depressed vital energy of the encephalon, as well as upon extravasation, or primary or consecutive vascular turgescence, and increased action — is manifest. And hence will appear the reason that restorative measures are required in some cases and not in others, or at one stage of an attack and not at another; physicians being led, by the success obtained from one method of cure on some occasions, to employ it too generally, and hence in many instances in which it is inappropriate.

152. The restorative means that may be resorted to, scarcely admit of particular notice. The practitioner must be guided in his choice of them by the circumstances of the case. Where there is sopor, or coma, or lethargy, without much stertor of breathing, and when hemiplegia or paralysis is not present, *camphor* in moderate doses, either alone, or combined with *ammonia* or the *spir. æth. sulph. comp.*, the *spir. lavand. comp.*, and various others, may be adopted. It is only in such cases, and when the action of the carotids is weak, the head cool, and the countenance sunk, that the *infusions of arnica* or of *serpentaria*, which have been recommended by QUARIN, AASKOW, WERNER and THOMANN, are admissible. In more doubtful cases, the preparations of *ammonia*, the *spiritus ætheris nitrici*, the infusion of *valerian*, may be cautiously exhibited. In some, particularly at the commencement of the seizure, *volatile substances*, such as the preparations of ammonia, and aromatic vinegar, held to the nostrils occasionally, will be of much service. Where the attack is either preceded or accompanied by hemiplegia or paralysis, (§ 31—43.), stimulants, whether exhibited internally, or held to the nostrils, may be more hurtful than beneficial. In these, even the use of cold applications to the head, excepting there be marked increase of temperature, is seldom productive of much advantage. *Purgatives* are, however, required, but the choice and repetition of them should entirely depend upon the state of the secretions, the torpor of the bowels, and the character of the stools.

153. *c. Remedies which have been recommended, and are admissible in certain states of either the sthenic or asthenic forms of attack.* — *Emetics* are amongst the remedies, the admissibility of which has been most questioned. The young practitioner will, if he have recourse to written authority, be quite bewildered by the diversity of opinions respecting them in this disease. He will find SYDENHAM, PITCAIRN, KIRKLAND, SELLE, FOTHERGILL, COLOMBIER, CONRADI and FABER, in favour of them; and HAGENDORN, BORSERI, QUARIN, WALTHER, CULLEN, TUESSINK, RICHTER, PORTAL, and CHEYNE, opposed to them. But, when the attack has been brought on by an overloaded state of stomach, by intoxication, narcotic poisons, or other hurtful ingesta, and more especially when hemiplegia is not present, or if the attack be of the active kind, and full depletion has been performed, emetics may be both safely and advantageously administered. This opinion seems agreeable to the recommendations of HIPPOCRATES, MORGAGNI, STOLL, BLANE, and the late Professor GREGORY.

154. The propriety of having recourse to *blisters* has likewise been questioned. The great majority, however, of authorities are favourable to the practice in some state or other of the disease, the situation, the period, and form of attack, being the chief points of dispute. BARTHOLINUS, CANDLER, CULLEN, and many others, recommend them to be applied to the head. Whilst TODE, BAGLIVI, STOLL, PORTAL, and PICQUE consider them injurious in this situation. In the active states of the disease, in those forms which are complicated with hemiplegia, or are preceded by it, blisters on the head seem hazardous reme-

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* Travelling in the summer, in one of the short stages, I sat opposite an aged and corpulent man, who, very soon after our leaving town, suddenly lost his consciousness and power of motion. His countenance became first pale, then bloated and inexpressive, his breathing slow and slightly stertorous, all his muscles completely relaxed, and he fell, in a few seconds, upon those sitting around him. We were only a few doors from a chemist's shop; the coach was stopped, and he was carried thither. He was now profoundly apoplectic; a copious perspiration flowed from his face and forehead, the veins of which were distended, and all his senses were completely abolished. There was no sign of hemiplegia, — but there was general and complete loss of motion and sensation. His neckcloth having been removed, the pulsation of the carotids was found to be slow, and of natural strength and fulness. Whilst he was held in a sitting posture in a chair, cold water was poured gently over his head from a sponge, and his head frequently sponged with it; volatile salts also were held for a short time, and at intervals, to his nostrils. The power of deglutition was at this time abolished, so that it was impossible to administer a draught, chiefly consisting of a small quantity of spiritus ammoniæ aromaticus and camphor mixture, which was prescribed. In a very few minutes his consciousness returned, he took the draught, and, in a short time afterwards, he walked to a coach, in which I accompanied him home. He now complained only of very slight confusion of ideas, with scarcely any headach, but his carotids beat more firmly. One full blood-letting, and an active purgative, were now directed. The next day he was perfectly well, and has continued so. What would have been the result if he had been largely blooded previously to the reaction?

dies, and are, moreover, in the way of more appropriate means; but in the weakest forms of the disease, when, from the depressed state of vital energy of the brain and lowered action of the carotids, the sensorium requires to be excited, they may be of service. Where, however, there is any doubt respecting the propriety of applying them in this situation, it will be better to omit them, or to direct them to another part. When stupor or coma exists, and the symptoms are not of the strong character, they may be applied to the nape of the neck, between the shoulders, or insides of the thighs or legs, after general or local blood-letting has been practised.

155. *Sinapisms*, or *stimulating frictions*, and *liniments*, applied to the lower extremities, are very generally applicable, particularly after resorting to pediluvia, care being afterwards taken to preserve a continuance of the increased flux of blood to these parts, when thus procured, either by warm applications, or by a frequent renewal of the above means. *Sternutatories* have been considered injurious by Baillou, Morgagni, Buchner, and others, and I conceive with great justice. A nearly similar opinion may be given respecting *electricity* and *galvanism*, which have been recommended to be tried by some authors.

156. The exhibition of *mercury*, chiefly in the form of calomel or blue pill, in large doses, so as to act upon the biliary secretion and bowels, and subsequently to excite *salivation*, has been recommended by Dolæus, Schurig, Ghisi, and Horn. My experience of the practice has led me to think favourably of it in most of the apoplectic states, when the powers of the constitution are not far reduced, and the patient is not very old. *Antimonial preparations* have already been prescribed, and are of much service in the more active or strong forms of the disease, whether accompanied with hemiplegia, or without it. They are not so admissible, however, in the very depressed states of vascular action, and in the forms of attack which commence slowly, or are preceded by, or attended with, paralysis, indicating softening and infiltration of the cerebral substance. *James's powder*, and the *tartarized antimony*, are the best preparations: the former of which may be advantageously combined with calomel; the latter with saline medicines. (See ℞. 21, 22, and F.854.)

157. *Setons, issues*, and *moxas* have also been advised, particularly when stupor continues after the more urgent symptoms have been mitigated. I concur with Lancisi and La Motte in considering them very deserving of adoption in such cases. *Moxas* applied on the occiput produce a more rapid effect, and are therefore preferable during the period of attack; setons are more suitable in the prophylactic and consecutive treatment. The *actual cautery* and *moxas* have been strongly recommended by Albucasis, who directed them in the course of the coronal suture; by Marcellus Donatus, who prescribed them to the occiput; by Schelhammer, to the vertex; by Schreiber, to both the vertex and soles of feet; by Misticheli, to the feet; and by Thilenius and Severinus. These means are very generally applicable, and may be resorted to in the worst cases of apoplexy, particularly those complicated with hemiplegia, and when brought in aid of appropriate means.

158. In cases characterised by a full, tumid, flushed, and livid countenance, full or strong pulse in the carotids, heat of head, with or without hemiplegia, I prefer, after copious general depletion, *scarifications* of the scalp, more or less deep and extensive, to be made over the occiput, so as to allow of a free sanguineous discharge. The practice has been recommended by Hippocrates and Morgagni. Cupping glasses may be also applied over the scarifications, when we desire to procure a more copious discharge. In the low or weak states of the disease, dry-cupping on the nape of the neck may be tried, as advised by Aretæus.

159. After the attack has been so far mitigated that the patient has recovered the faculty of deglutition, I have often seen decided advantage derived from a draught consisting of equal quantities of the *oleum terebinthinæ* and *oleum ricini*, particularly when the bowels required to be fully acted upon. If the attack possess the sthenic character, and signs of fulness of blood about the head still continue, about half an ounce of each may be exhibited on the surface of mint water; and, if necessary, repeated a second or third time, from twelve to twenty-four hours intervening between each dose. This will promote a more complete revulsion from the head than any other means that can be employed, particularly when preceded by calomel, or other cathartics, or followed by the enema prescribed above. (§ 144.). In the weaker states of attack, when we wish the medicine to act partially, by being absorbed into the circulation; and in cases where, from the mode of seizure and progression of the disease, we suspect hæmorrhage or infiltration of blood in the brain, the following draught may be exhibited: I have found it serviceable in such cases, even in some attended with the most unfavourable symptoms; as very frequent, small, and intermitting pulse, and unconscious discharges, &c.: —

No. 28. ℞ Olei Ricini, Ol. Terebinth., āā ʒ ss.—ʒ ij.; Tinct. Capsici Annui ♏ x.—xvj.; Olei Cajeputi ♏ iv.—vj.; Aq. Menth. Virid. ℥ jss. Fiat Haustus, omne bihorio sumendus ad secundum, tertium, vel quartum vicem.

In some instances, where the lethargy has been profound, and the constitutional powers far depressed, I have derived much advantage from *camphor*, *ammonia*, and *æther*, given in suitable doses in the intervals, and continued after the above medicine had been carried as far as was considered either necessary or prudent.

160. It is generally requisite to have the hair of the patient cut very close, or shaved off, as soon after the seizure as possible; and to attend to the injunction of Morgagni, never to omit enquiring after the state of the urinary discharge, and examining the hypogastrium, lest accumulations of urine take place, which should be immediately removed by the catheter, to prevent their injurious effects on the disease, and on the bladder.

161. *d. Of the treatment of the consecutive and complicated states of apoplectic seizures.* — A great majority of such cases requires but very slight modifications of the measures already stated. The importance of directing our means so as restore *suppressed discharges*, &c. when the attack arises from this cause, has already been pointed out. When it proceeds from the extension of

inflammatory action to the brain, and its termination in abscess, effusion, &c., the principles stated above are still applicable. If the disease possess either a *gouty* or a *rheumatic character* (§ 92, 93.), bleeding from the feet, local depletions, sinapisms, or other rubefacient applications, &c. to the lower extremities, or to the joints or parts antecedently affected by gout or rheumatism, active purgatives, and the preparations of colchicum combined with soda, and moderate doses of camphor, are the most advisable remedies. In most cases of this description great accumulations of morbid sordes have formed on the digestive mucous surfaces, and thick or viscid dark bile in the gall-bladder and hepatic ducts; therefore, after cupping on the nape of the neck, active calomel purges, promoted by enemata, are to be given, previously to having recourse to *colchicum*, which ought to be combined with alkalies, — with *ammonia* or other restorative medicines, if the attack presents the asthenic character, and with aperients; active *revulsants* being simultaneously employed.

162. When the apoplectic state arises from *erysipelas* of the head and face, incisions made into the scalp of the occiput, so as to allow a free discharge; cupping on the nape of the neck; active purgatives, consisting first of calomel combined with the tartrite of antimony or with James's powder, and compound extract of colocynth, followed by the draught of turpentine and castor oil advised above (§ 159.); and saline medicines, with the vinum antimonii; are the means most to be depended upon. In cases of this description the most active purgatives are required, and must be frequently repeated. The croton oil may be here exhibited, as already advised (§ 144.), and enemata should be administered from time to time. These already prescribed (§ 144.), or F. 141. 151. are most to be depended upon in this state of disease. Revulsants, and rubefacient pediluvia, are also serviceable aids.

163. When the apoplectic attack occurs on the invasion, or in the advanced stages of *fevers* (§ 94.), the general principles of treatment already laid down cannot be departed from. When it comes on at the commencement of fever, general or local depletions are required, with cold affusion to the head, purgatives, saline medicines, and counter-irritation. But even here, the probable state of the circulation within the head should be enquired into previously to the adoption of the means of cure; for, if the head be cool, the action of the carotids natural or below the healthy standard, and the attack be unattended by paralysis, restorative measures are called for, although the subsequent occurrence of reaction will afterwards require active antiphlogistic measures. When the attack occurs in the last stages of continued or eruptive fevers, it most frequently presents the asthenic character, and is often an aggravated state, or a modification merely, of coma, unless hemiplegia accompany it. In these cases, local depletions from the occiput, the neck, and behind the ears; active purgatives; revulsants and counter-irritants, as blisters or sinapisms to the lower extremities, nape of the neck, or epigastrium; camphor, combined with ammonia, æther, and liquor ammoniæ acetatis, particularly when the head is cool, and the pulsation or the carotids is neither full nor strong; and, in the most asthenic cases, camphor in larger doses, the infusions of arnica, or of serpentaria (F. 222. 262.), are chiefly to be depended upon. After local depletions and revulsants have been prescribed, and one or more doses of calomel and rhubarb premised, the draughts directed above (℞ 23. 26, 27, 28.), or F. 270. 863., followed by enemata (F. 138. 149.), may be exhibited.

164. The association of apoplectic seizures with disorders of the *digestive organs*, particularly those of the liver (§ 97, 98.), requires local depletions from the right hypochondrium and epigastrium, followed by blisters in this situation, and a strenuous use of purgatives and mercurial preparations, until the secretions assume a healthy appearance. When the attack proceeds from impeded circulation through the lungs and right side of the heart (§ 95, 96.), local depletions, counter-irritation, and diaphoretics, are chiefly to be depended upon. But in these cases care must be taken not to deplete too much, as the circulation may be still more impeded by the loss of power thereby produced. In some instances of this kind, it will even be necessary to support the vital energies by suitable means, and to deplete the vascular system at the same time. When the attack is occasioned by hypertrophy of the left ventricle, general and local depletions are better borne than in the foregoing cases, and may be carried to a considerable extent. In both descriptions of cases, revulsants and counter-irritants, particularly by issues, and the tartar emetic ointment, are beneficial.

165. When the attack is occasioned by *narcotics or spirits* taken in immoderate quantities, the stomach should be emptied by the stomach-pump, or by an emetic, a moderate blood-letting having been premised; and afterwards, the cold affusion to the head; internal stimuli, as camphor, ammonia, and ether; warm, strong coffee; and purgative enemata, should be prescribed. The occurrence of the seizure, also, during *child-labour*, or after *epileptic or hysteric* convulsions, requires large blood-lettings, preferably from the feet, the cold affusion to the head, cathartic injections, &c.[*]

166. Attacks consequent upon *colica-pictonum* (§ 99.), two instances of which have occurred to me, generally require local depletion, full doses of calomel, followed by active purgatives and enemata (§ 142.). The draught of castor oil and turpentine (§ 144.), or the croton oil, followed by injections, are here chiefly to be confided in. If purgatives given by the mouth are thrown off the stomach, — a circumstance which not infrequently occurs in these cases, — a large dose of

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[*] I was lately called to a case of puerperal convulsions which had terminated in the apoplectic state. When I saw the patient, the labour had not proceeded so far as to admit of delivery by means of instruments. The pulse was slow and full; the breathing slow, laborious, and stertorous; the lips puffing and frothy, the countenance tumid and livid; all the limbs flaccid, insensible, and incapable of motion. She had been blooded largely before I was called. The feet and legs were directed to be placed in a pan of hot water, and the saphenæ veins to be opened. Whilst the blood flowed, the cold affusion on the head was employed. These means were evidently beneficial, though insufficient. A cathartic enema (F. 149.) was thrown up immediately, and with great difficulty: consciousness slowly returned; when the decoction of the secale cornutum, with as much boras sodæ as it could dissolve, was administered. Uterine action afterwards came on, and the patient recovered.

calomel will generally be retained; and will allay the irritability of the stomach: other medicines may be afterwards exhibited, or a mixture of croton and castor oils rubbed over the abdomen, and cathartic injections thrown up. The other states and complications of the disease must be treated according to the views and principles already explained, and with due reference to the nature of the pre-existing disorder, when it appears to be a consecutive affection, or a principal part of a complicated state of disease.

167. C. TREATMENT SUBSEQUENTLY TO THE ATTACK, OR THE CONSECUTIVE TREATMENT. — The symptoms consecutive of apoplexy have a strict relation to the changes which take place in the seat of lesion. The absorption of the blood, and the process of cicatrization, require several months for their completion. During this time great care should be observed to prevent inflammatory action from taking place around the extravasated blood, and a return of the hæmorrhage. This object is best obtained by adopting very nearly the same measures as have been recommended to prevent the accession of the attack (§ 126. *et seq.*). A too sedentary or studious mode of life, watchfulness, much indulgence of sleep, frequent stooping, and all the remote causes of the disease, must be carefully shunned. The strictest temperance and moderation, in respect both of eating and drinking; moderate exercise in the open air; tranquillity of mind, sedulously avoiding the least approach to bodily or mental fatigue, and excitement of the feelings or passions; the preservation of a free state of the alvine secretions and excretions, by means of mild and deobstruent purgatives and catharthic enemata; general or topical blood-letting, particularly every spring and autumn, with low living or a vegetable diet, when there is a tendency to vascular plethora; caustic issues, or setons in the nape of the neck, or in the course of the cervical spine; the use of the tartar emetic ointment, so as to keep out for a considerable time a pustular eruption on the part to which it is applied; sleeping on a hair-mattress, with the head and shoulders slightly elevated, and early rising; are amongst the most efficacious means that can be adopted.

168. For persons who are prone to plethora, in addition to periodical depletions and low diet, the following pills and electuary may be taken on alternate nights: —

No. 29. ℞ Pilul. Hydrarg. Submur. Comp. gr. iij.; Pulv. Jacobi Veri gr. ij.; Saponis Castil. gr. iv. M. Fiant Pilulæ ij. h. s. s.

No. 30. ℞ Potassæ Supertart. ʒj.; Sodæ Sub-boratis gr. x. (vel Magnesiæ ℈j.); Confectionis Sennæ, Syrup. Zingiberis, āā ʒj. M. Fiat Electuarium, pro dose, horâ somni, alternis noctibus sumendum.

169. When the disease is connected with the gouty diathesis, vegetable diet, the sub-carbonates of the fixed alkalies, with the extract of taraxacum or the preparations of aloes, the occasional use of an active cathartic, and the other prophylactic measures recommended in the article on GOUT, are requisite. In all cases, as much benefit will now accrue from a strict attention to regimen and diet, as from medicine. The food should be light and digestible, of very moderate quantity, chiefly farinaceous, and taken at regular hours. Suppers should be avoided, or be extremely light, and taken a considerable time before the usual hour of repose. Fish, and ripe fruits, may be partaken of in moderation; and the waters of Cheltenham occasionally tried, or the following used as a substitute: —

No. 31. ℞ Magnes. Sulph. ℥ss.; Potassæ Sulph. ʒij.; Infus. Rosar. Co. et Mist. Camphoræ āā ℥iijss. M. Capiat Coch. iij. ampla primo mane quotidiè.

170. After attacks of the more asthenic states of apoplexy, a more tonic regimen than that directed above may be adopted; but it should be conjoined with the same attention to the digestive, secreting, and excreting functions. Attacks of this description most commonly proceed from depressing or exhausting causes, which ought either to be avoided or counteracted; and when they are not characterised by plethora, or disposition to increased action, gentle tonics, combined with aperients, a light strengthening diet, the occasional use of the preparations of *strychnine*, or *iodine*, as recommended in the article on PALSY, and the mineral waters of Bath, Leamington, or Buxton. The following may also be occasionally taken: —

No. 32. ℞ Potassæ Sulphatis ʒij.—ʒiij.; Infus. Rosar. Co. ℥vijss; Acidi Sulphur. Arom. ʒj.; Tinct. Aurantii Co. ℥ss. M. Capiat Coch. iij. ampla primo mane.

171. In all cases of the consecutive treatment, the progress of the paralytic or hemiplegic affection towards removal should receive attention. In the more favourable cases, as the period of attack recedes, first sensation, and afterwards motion, return in the paralysed limbs; and generally the lower extremity experiences the amendment before the upper. As recovery proceeds, the patient should always wear his hair cut short, and sponge his head with spring water night and morning. In summer he may use the shower bath daily, if he be not far advanced in life, or much debilitated. As much of the treatment described in the article PALSY, as may suit the circumstances of the case may also be adopted, for the removal of this common sequela of the attack. (See also ASPHYXY, and POISONS.)

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1. APOPLEXY OF NEW-BORN INFANTS — Generally proceeds from a protracted or difficult parturition, particularly when the infant is large and plethoric, or when the chord has passed around the neck, occasioning both interrupted circulation in the chord, and obstructed return of blood from the brain. The apoplectic state in new-born infants is accompanied with tumefaction of the face, head, and neck, which, with the whole surface of the body, is generally of a bluish or violet colour. The muscles are flaccid, the limbs flexible, and the body warm. The pulsations of the heart and of the chord are generally obscure, or not to be felt; respiration is suppressed; and death soon takes place, in extreme cases, if judidious means of restoration be not resorted to.

2. Upon examination of fatal cases, the vessels of the encephalon are engorged with blood; and occasionally blood is extravasated in the substance of the brain, or between the membranes. The lungs are also generally congested. It is evident that the pressure of the turgescent vessels and extravasated blood upon the brain, and origin of the respiratory nerves prevents the respiratory actions from taking place, and that all attempts to excite respiration will be ineffectual until the pressure is removed. The umbilical chord should therefore be immediately divided, and allowed to bleed to the extent of two or three spoonsful, according to the size and strength of the infant. When the apoplectic state is occasioned by congestion of the vessels merely, respiration will take place as soon as the vessels are unloaded, if no mechanical obstacles to the entrance of air into the lungs exist. Mucosities should be carefully removed from the throat, mouth, and nostrils; and, if the respiration does not spontaneously take place, insufflation of the lungs, as recommended in the article on ASPHYXY *of New-born Infants* should be performed.

3. When the circulation is so torpid that the blood will not flow from the portion of umbilical chord attached to the infant, the little patient should be placed in a warm bath, rendered more stimulating by some salt, or by a little mustard; the portion of chord attached to the abdomen, or the abdomen itself, may be pressed momentarily, at several times, and in the direction of the division. If these means fail of procuring blood, one leech may be placed behind each ear. In some cases the apoplectic symptoms return after respiration has been established. This is generally owing to some interruption to the circulation through the lungs. In these cases of secondary attack, the application of one, or generally two leeches, placing the body or the lower part of it in a warm bath, and, if requisite, inflation of the lungs, and the other measures advised in the article on ASPHYXY, must be resorted to; and they will be successful if the case admit of recovery.

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APPETITE, MORBID.

CLASSIF. 5. *Class*, Local Diseases; 2. *Order*, Depraved Appetites (*Cullen*). 1. *Class*, Diseases of the Digestive Functions; 1. *Order*, Affecting the Alimentary Canal (*Good*). II. CLASS, I. ORDER (*Author*).

1. DEFIN. — *Excessive craving for food, or desire for improper substances.*

2. In this genus may be included *two* species, viz. 1st, Excessive or insatiable craving for food; and, 2d, A desire for improper substances, or what is not food. These states of function occur in practice variously associated and, although apparently different in themselves, yet they are often individually connected with similar states of the constitutional energies, and dependent upon nearly the same state of lesion, whether functional or organic. It would seem that manifestations of function often differ most essentially, in different persons, or under different circumstances, owing to causes which are so slightly dissimilar as not to admit of distinction, or even, in some cases, to appear very nearly the same. In all, or the great majority of cases belonging to these forms of morbid function, the general pathological states of the system are nearly the same; the difference, even when it is most marked, being chiefly referrible to variations in grade, and to states of the stomach, in respect of its sensibility, its secretions, tonic contractions, and states of its villous membrane, which can only be matters of inference, but seldom of demonstration. As regards their nature, these affections are much more frequently *symptomatic* of lesion of function or structure in some other organ, than *idiopathic*, or constituting primary disease of the stomach itself.

3. Spec. I. INSATIABLE APPETITE. — SYN. *Bulimia* (from βοῦ, the augmentative particle, and λιμὸς, hunger), *Fames Canina*, *Limosis avens*, Good. *Bulimus*, *Polyphagia*, *Lycorexia*, *Cynorexia*, Auct. Lat. *Faim Canine*, Fr. *Der Heisshunger*, Ger. *Dyspepsia Bulimia*, Young. *Gluttony*, *Canine Appetite*.

4. DEFIN. *A craving for food beyond the natural wants of the system, sometimes most excessive in degree.*

5. I. Varieties. An inordinate appetite is sometimes observed in the course of fevers and other acute diseases, particularly in convalescence from them; and in the progress of a number of chronic diseases. It is not infrequent in cases of extreme exhaustion, from whatever cause; and it may depend upon an acquired habit. But in order to consider it with some degree of precision, I will offer some remarks, 1st, upon habitual indulgence in an excessive quantity of food, or gluttony; 2d, an insatiable appetite from exhaustion; 3d, on the excessive appetite, which, from the extreme voracity of the patient, has been called canine; and, 4th, on the voracity which is followed by vomiting. These constitute varieties of nearly the same disease.

6. *A. Habitually excessive appetite, the Bulimia Helliconum of* Cullen.—In some cases, the excessive indulgence of food has been of so long duration, and seemingly attended with so good a state of the general health, as not to appear in the light of a disease; but the results ultimately are, the production of so great vascular plethora, and disorder of the secreting functions, that, as soon as the vital energies begin to languish, apoplectic, paralytic, or other maladies supervene. This variety of morbid function may be hereditary, but it is oftener acquired. It is not infrequently observed in persons, originally of a strong constitution, who have indulged in large and frequent meals from having little else to engage their minds, and thus the vital energy has become concentrated towards the stomach and the rest of the digestive organs, exalting all their functions. Persons of this description usually become large, bulky, or corpulent; and if they take much exercise, the great indulgence of their appetite may not materially shorten their lives: but when sedentary habits and indolence are conjoined with it, apoplexy and organic disease of the liver, stomach, bowels, &c. are the common results.

7. *B. Inordinate appetite from exhaustion.*—This is often a symptom of other diseases, and is chiefly dependent upon altered sensibility of the nerves of the stomach, proceeding from weakened vital power. In many cases, however, it appears as the chief ailment, as after great fatigue of body and mind; after excessive venereal indulgences; in cases of great emaciation, sometimes without any evident cause; and during convalescence from fevers and other acute diseases. It is very often observed as an attendant upon organic diseases of the stomach, pylorus, mesenteric glands, liver, uterus, &c. It has also been remarked in cases where due nourishment could not be conveyed into the system, owing to disease of the absorbent system; and it is frequent in the last stages of chronic maladies, when about to terminate fatally. In many of such cases the craving for food is attended with a distressing feeling of inanition, sinking, and faintness. Some of the cases of excessive appetite that occur in pregnancy, or from the presence of worms, may also be referred to the debility and altered sensibility of the nerves of the stomach. And those which accompany inanition from a defective supply of chyle to the blood, may be attributed partly to the same cause, and partly to the instinctive wants of the system.

8. *C. Voracious or canine appetite, the Bulimia Syncopalis of* Cullen.—This extreme form of the disease is generally dependent upon some organic change of the stomach; but this is more a matter of inference than of observation. The chief seat of disease may even be some other organ. The quantities of food, particularly animal food, cooked or raw, taken by some persons afflicted by this disease, are truly surprising.* One of the most remarkable cases in record is that published by M. Percy (*Dict. des Sciences Méd.*, art. Cas. Rares). Both Cullen and Good are incorrect in stating that this form of Bulimia is attended with faintness. This is only an occasional symptom, which was absent in both the cases that occurred to me, as well as in that recorded by Dr. Crane. (*Lond. Med. Repos.*, vol. xvii. p. 293.)

9. *D. Voracious appetite followed by vomiting, the Bulimia Emetica of* Cullen.—This variety of bulimia frequently proceeds from inflammatory irritation about the pylorus, but more commonly of the mucous surface of the stomach itself. The quantity of food devoured in this description of cases is often as large as in the last variety; but, shortly after having been taken, it is either altogether, or in part, thrown up, very little altered, and thus the patient continues alternately to crave for and to reject his food. This form of the disease has generally been imputed to a scirrhous state of the pylorus; but the case of Dr. Crane, already alluded to, was evidently independent of such a cause.

10. II. Causes.—*a.* The *remote causes* of bulimia are chiefly hereditary predisposition; the habit of eating largely, voraciously, and without due mastification; chronic debility arising from obstruction of the mesenteric glands, liver, &c.; the suppression or disappearance of chronic eruptions, the healing of old ulcers, or the suddenly arresting habitual discharges, and the pathological conditions noticed in the foregoing remarks.

11. *b.* The *immediate cause*, or state of the organ on which it depends, seems to be somewhat different in the different varieties, even whilst the state of the constitutional or vital power may be considered to be, in the great majority of cases, very nearly the same. I believe that in many instances the voracious appetite is owing to an irregular distribution of the vital energy, and its concentration in the stomach, the nerves of this

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* I have met with two very remarkable instances of this affection in children,—the one of seven years of age, the other of nine. In both these, but in the younger especially, the quantity of food devoured was astonishing. Every thing that could be laid hold of, even in its raw state, was seized upon most greedily. Besides other articles, an uncooked rabbit, half a pound of candles, and some butter, were taken at one time. The mother stated, that this little girl, who was apparently in good health otherwise, took more food, if she could possibly obtain it, than the rest of her family, consisting of six besides herself. In both this and the other case, the digestion seemed to be good. Three or four large feculent motions were passed daily, and a nauseous smell emanated from their bodies. These children, who were both very intelligent, complained of no other uneasiness than a constant gnawing or craving at the pit of the stomach, which was never altogether allayed, but which, shortly after a meal, impelled them irresistibly to devour every thing that came in their way, in the shape of food, however disgusting. Nearly twenty years ago I saw, for a short time, a case of this description, which occurred in a child of about the same age, and occasioned alarm, owing to the circumstance of a large quantity of raw fish having been devoured by it. The result in this case did not come to my knowledge, but the former cases, which occurred at the Infirmary for Children, recovered by means of the treatment which will presently be noticed.

viscus being morbidly sensible, the muscular coats more irritable, particularly in the fourth variety of the disease; and the mucous coat in a state of erythism, or vascular excitement, and yielding a much larger quantity of its proper fluids than in health. The excited state of the nerves of the organ, will necessarily be followed by increase of its secretions, greater vascularity of its inner coat, and a disposition of the muscular tunics to react upon the enormous quantity of food which distends them; and thus there will result the craving of extreme hunger, a rapid solution of the food, and a quick transfer of it into the duodenum; or, if the reaction takes place suddenly, either vomiting or simple regurgitation of it, as in cases of *rumination*, which is sometimes *complicated* with bulimia. The more remote *effects* of this state of the organ are, torpor, debility, and a sense of faintness arising from the concentration of the vital energy, and determination of the circulation and secreting function towards the stomach and associated viscera, and the proportionate abstraction of vital influence from the brain and heart; imperfect assimilation; irritation of the digestive mucous surface, from unwholesome and unchanged food; an impure state of the blood, disorder of the secreting organs and morbid secretions, — all tending to disorganisation, and to the destruction of life.

12. *c*. The *morbid appearances*found on dissection consist chiefly of inordinate distension of the stomach and duodenum; a vascular and corrugated state of their mucous surface, constituting complete hypertrophy of these viscera; a flabby, softened, and sometimes thickened appearance of all these tunics (HAGSTROEM); displacement of the right extremity or the greater part of the stomach low in the abdomen (FRENCH); induration and thickening of its coats (GOUDRET); the insertion of the common bile-duct into its pyloric extremity (VESALIUS and BONET); dilatation of the œsophagus (SCHURIG); tænia in the bowels; lumbrici in the stomach and duodenum; enlargement and other organic lesions of the liver; scirrhus, thickening, and even dilatation (RUYSCH), of the pylorus; thickening of all the coats of the duodenum, forming hypertrophy of this part; and various organic changes in the mesentery, its glands, the pancreas, spleen, and very generally in the mucous surface of the small and large intestines. M. BECLARD observed, in a case of bulimia, the valvulæ conniventes as large as in carnivorous animals. And M. LANDRE-BEAUVAIS found, in a case complicated with pulmonary consumption, an unusually large size of the small intestines, and the gall-bladder wanting.

13. *d*. *Symptomatic bulimia.* — Inordinate appetite has sometimes been observed in cases of chronic disease of the brain, particularly in slow inflammation of its substance, threatening, or terminating in, insanity. A very marked case of this description, and two or three slighter instances, have come before me in the course of practice. I have also met with it at the commencement of hydrocephalus, and in epilepsy. When thus dependent upon disease of the brain, the inordinate indulgence of the appetite is often followed by vomiting. In the case of epilepsy, however, in which I met with it, vomiting never took place, although the quantity of food sometimes taken was most excessive. The first, or slighter variety of the malady, is not uncommon in epilepsy, particularly in the hereditary epilepsy of adults; the second variety sometimes occurs in hysteria, chlorosis, and pulmonary consumption; and the fourth, occasionally, in chronic encephalitis.

14. Bulimia is more frequently met with, particularly in its slighter forms, in pregnancy and in verminous affections, and is then very generally attended with an urgent feeling of inanition and faintness. When it occurs in pregnancy, there is usually a fanciful longing for particular articles of food, of which an enormous quantity is devoured. A remarkable excitement of the nerves of the stomach may be inferred to exist in these cases, greatly augmenting the secretion of gastric juice. When the affection proceeds from worms, it may be imputed to the irritation of the nerves and mucous surface of the stomach and duodenum, whereby the circulation of, and secretions poured into, these viscera, are much increased, whilst the vital actions of the rest of the frame languish more or less.

15. III. TREATMENT. — The means of cure should have strict reference to the immediate cause to which we attribute the disorder. *A*. In the *first variety* of the disorder, it is generally in vain to state any means of cure. They entirely rest with the patient, by whom medical advice will seldom be followed. I have great doubt of a single glutton having been deterred from the habit he has acquired, by the injunctions of his medical adviser, until an attack of illness occasioned him alarm. The cure is sufficiently simple, and may be comprised in the single recommendation of employing his mind and body more, that he may abuse his stomach less.

16. *B*. In the *second variety*, great attention is required to adapt the treatment to the circumstances in which it presents itself. The nature of the malady of which it is most commonly a symptom, must necessarily be our guide; and as the means should be strictly appropriated to the peculiarities of the case, no general rules can be stated with propriety, further than that the effects of whatever is employed should be carefully watched, and that more mischief will result from indulging the craving complained of, than from opposing it, and allowing no more nourishment than the nature of the case, or the system, may seem to require. In the bulimia that occurs in convalescence from acute diseases, the wants of the economy are generally greater than in other cases, and here more may be allowed: if fever or disorder follow the indulgence, a purgative will generally remove it.

17. *C*. The preceding observations apply likewise to the *third and fourth varieties* of this disease. The cases which occurred in my practice were cured by an active course of nauseating purgatives, consisting chiefly of the oil of turpentine with castor oil. In one of the cases, where the voracity was almost incredible, the first dose of the turpentine was followed by the sudden appearance, over the whole trunk of the body, of a most copious and thick eruption, more nearly resembling porrigo favosa than any other, and by the equally sudden relief of the symptoms. This treatment was left off; when, after a few days, the eruption disappeared, and the voracious appetite returned. It was ultimately removed permanently by the hydrarg. cum cretâ, combined

with soda, taken at bed-time, and a turpentine draught in the morning of each third or fourth day. Leeches were applied over the epigastric region; and either the tartar emetic ointment, or liniment, was rubbed upon the same situation till a copious eruption of pimples was produced. The strictest regulation of the diet was enjoined.

18. *D.* In the *variety* attended with *partial or general regurgitation*, or vomiting of the food taken in excessive quantity, the best effects will result from obliging the patient to abstain almost altogether from food, or to take a small portion of nourishment in the least possible bulk. Great distress from hunger will be felt for a few days, but this will gradually subside. In the instructive case published by Dr. Crane, this plan was persisted in; and portable soup, made into pills, was given, as the only nourishment, for several weeks: the patient recovered perfectly. A nearly similar treatment had been previously employed by Mr. Wastell with success. (*Mem. of Med. Soc. of Lond.*, vol. iii. No. 2.) Where, however, the stomach is not so irritable as to throw off any portion of the ingesta, and has become distended and enlarged from habitual ingurgitation, a gradual diminution of the food will be better borne, and perhaps be more efficacious, than its sudden reduction. The propriety of employing deobstruents, small doses of the blue pill, combined with ipecacuanha, active cathartics, either by the mouth or in the form of enema, and external irritants and revulsants, in cases of this description, cannot be questioned. Exercise, where it can be taken; and employment for both body and mind, as far as circumstances will permit; are also most useful adjuncts.

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Spec. II. Vitiated or Depraved Appetite. —Syn. Pica, *Citta*, *Malacia*, *Pseudorexia*, *Limoxis Pica*, Good. *Dyspepsia Pica*, Young. *Der Sonderbare Appetit*, Ger.

1. Defin. *An appetite for substances which are not food.*

2. Causes.— This state of the appetite sometimes occurs in children, from an early acquired habit; and it is frequently observed in idiots, from want of ability to discriminate what is or is not food, or from perversion of taste. Various substances also, which are abhorred in one climate, constitute the chief articles of diet in another. Thus, the Californians live on snakes, rats, lizards, &c., and numerous tribes of Africans on monkeys, dogs, snakes, &c. It is very frequently observed in pregnant, hysterical, and chlorotic females, and it is sometimes connected with certain kinds of mental emotion. I have met with several instances of it in females at the age of commencing puberty, when neither hysteria, in any of its forms, nor chlorosis, existed. In these, and perhaps in the great majority of cases, it is altogether a symptomatic affection, arising from altered sensibility of the nerves, and modified state of the secretions of the stomach, occasioned by imperfect function, or changed condition, of a related organ, particularly of the uterus, ovaries, large bowels, and brain.

3. When it is observed as the primary disorder, it has generally been owing to a habit, commenced at first with the view of improving the shape and complexion. Females early in life sometimes have recourse to acids, particularly vinegar, and chalk, for this purpose. The form of the disease, which has been described by Dr. John Hunter as dirt-eating, by the negroes in the West Indies, and which has even assumed an epidemic character, is, perhaps, more than other forms of it, deserving of being considered as idiopathic. The earth they devour chiefly consists of a loam or clay, and may possibly be taken by them from the circumstance of their having found it assuage the painful sensations produced in the stomach by acidity. This affection is much more frequently met with in the female than in the male sex; but instances of its occurrence in the latter are not rare. I have seen several instances of it in males; and in females it is often practised in so concealed a way, as not to come to the knowledge of the medical attendant.

4. The substances which occasionally become the objects of desire are sufficiently numerous. Medical records abound with them. Cinders, spiders, lice, flies, insects, toads, serpents, wood, hair, paper, earth, clay, chalk, vinegar and other acids, and even ordure, have all been devoured in cases of this disease. Various other substances have been swallowed, more as singular exploits than from actual longing for them. Thus we have accounts of persons taking into their stomachs clasp-knives, musket bullets, billiard balls, gold watches, and Louis-d'ors; and, what is still more singular, generally discharging them by stool a few days afterwards. Knife-eating seems to have been no uncommon feat, as we have instances recorded of London, Prussian, Bohemian, North American, and Brazilian knife-eaters. Our friends of the United States seem to have surpassed all others in the rapacity which their knife-eater exhibited; for in June, 1822 (*New York Med. Repos.*, Oct. 1822), after having been duly initiated in the art, by swallowing a gold watch, chain and seals, billiard balls, and various other articles, at different times, which had passed through his callous digestive tube, he swallowed fourteen knives in the course of the day. This was his great, but his last exploit, for he died two months afterwards; having passed two of the knives by stool, the remaining dozen being found in the body,—eleven in the stomach, and one in the œsophagus.

5. The articles most commonly fancied by young females are paper, cotton, thread, chalk, vinegar and other acids. I once saw a sickly-complexioned lad, who was in the habit of eating sand; and a robust seaman, who occasionally would devour a whole wine or ale glass, having previously crushed it in small pieces with his teeth, and yet no bad effects resulted, at least for many months afterwards. (*Lond. Med. Repos.* vol. xviii.) The only other instance on record, where this most dangerous feat has been performed, is given by Camerarius (*Memorab.* cent. v.).

6. When *pica* is complicated with *bulimia*, as

is sometimes observed, most singular and even astonishing feats in the way of devouring substances of the most unsuitable kind are on record, —many of them also so large, that the possibility of their being conveyed into the stomach, if they had not actually been found there, might have been doubted. Some really astonishing and authentic instances of this kind have been related by M. Fournier (art. Cas. Rares, *Dict. des Sciences Méd.* t. iv. p. 135.).

7. Treatment.—The means of cure must, of course, have strict reference to the morbid condition of the system, of which it is so frequently a symptom. If it accompany pregnancy, I believe that the axiom which M. Francier adopts as the title of a treatise on the subject should be adopted, viz. A pregnant woman affected with pica should be well purged. If it be attendant upon *chlorosis*, aloetic *purgatives*, with emmenagogues, and these followed by or given alternately with *tonics*, are the most suitable means, and are equally beneficial in the pica which occurs about the period of puberty. In hysteria, similar measures, combined with valerian, asafœtida, camphor, and other antispasmodics, are indicated. In these three symptomatic forms of the disease, any of the Formulæ for those medicines in the Appendix may be adopted.

8. When the affection presents an idiopathic, which is comparatively rare, it is most commonly owing to a weakened state of the digestive organs, with, perhaps, an altered sensibility of the nerves, and acid state of the secretions of the stomach. In these cases, the combination of vegetable tonics with alkalies, and attention to the alvine secretions and excretions, are chiefly to be attended to. The treatment of cases of the affection induced early in life from habit, will be unsatisfactory, or without avail, until the cause is removed; but it differs in no essential particular from that now stated. In many cases the pernicious habit has commenced with early puberty, and, as well as in the cases associated with chlorosis, hysteria, pregnancy, and irregularity of the menstrual discharge, is evidently dependent upon the state of the uterine functions. (See Chlorosis, Menstruation, &c.)

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ARTERIES, THEIR DISEASES.—Syn. *'Αρτηρία*, Gr. *Artèria*, Lat. *Artere*, Fr. *Eine Schlagader, Pulsader*, Ger. *Arteria*, Ital. *Artery*, Eng.

1. The morbid conditions of arterial vessels cannot be appreciated, either in respect of their causes, symptoms, or consequences, unless their organisation and connections with other systems of the frame be clearly understood. It does not fall within my limits to notice all the connections which these vessels present with other parts of the body; but there are a few to which I will briefly allude, as most material in the causation of their diseases, and of certain sympathetic affections with which these diseases are related.

2. I. Organisation.—The arterial tubes are essentially constituted, 1st, Of an external and adventitious tunic, consisting of a very delicate and condensed cellulo-filamentous tissue. This tissue is never infiltrated by serum, nor loaded by fat; and possesses the greatest degree of resistance of all the other coats of the vessel. 2d, Of a proper coat, consisting of fine circular fibres placed closely together, and forming a strong tissue of a dun yellowish colour. The nature of this tissue has been a matter of much dispute with pathologists. It certainly does not possess the physical and chemical properties of the fibres of voluntary muscles, from which it chiefly differs in being much more close in its structure, and more elastic and fragile than they. It more nearly approximates to the fibres of involuntary and hollow muscles, as those of the intestinal canal. 3d, Of a very delicate cellular tissue, like a fine pellicle, the *second cellular* tunic of Haller, interposed between the fibrous or proper coat and that next to be described. It is in this fine membrane that the minute vessels supplying the arteries, and which proceed from the adjoining parts, terminate; and here also the ultimate distributions of the arterial nerves may be supposed to ramify, although they cannot be clearly traced further through the coats of the vessel than the proper fibrous tunic where I have distinctly followed them. This is the most vascular of the tunics strictly constituting arterial vessels; and one in which many of those changes which will fall under consideration commence. 4th, Of an internal membrane, presenting no linear or fibrous structure, semi-transparent, more readily detached from the one next to it in the longitudinal than in the transverse direction, and fragile. This delicate membrane is not possessed of vessels carrying red blood in the healthy state, but it is penetrated by minute red vessels when inflamed. It lines, with scarcely any perceptible modification, the canals of all the vessels conveying red blood, and the cavities of the heart.

3. The arterial vessels thus formed are surrounded by a sheath of loose cellular tissue, more or less abundant in some parts than in others, permitting the vessels to accommodate themselves to their varying state of dilatation, constriction, &c., and transmitting the vessels which are employed in their nutrition. The elastic properties, also, of the proper coat of the vessels, serves also to accommodate their capacity to the state of the circulating fluid; and as it is generally supposed that they are in a certain degree of distension during life, owing to the quantity of blood constantly being impelled through them by the heart's contractions, so it is believed that the contractions which they display on the removal of this fluid is at least partly owing to the abstraction of the distending cause.

4. No trace of longitudinal fibres can be detected in arteries. The elastic properties which they present in the direction of their axis, when extended beyond their natural limits, and their retraction upon their division, are chiefly owing to the dense cellular coat immediately surrounding the proper fibrous structure of the vessel. The different degrees of tenacity presented by the various structures composing the parietes of these

vessels, acting conjointly with the elasticity of the proper coat, have been considered by many as sufficient to account for the absence of hæmorrhage after laceration of these vessels. Doubtless these circumstances contribute, but I conceive that they are insufficient of themselves to account for this and other phenomena, which will be noticed in the sequel.

5. The arteries are surrounded by the ganglial nerves, which form a reticulum around them; and from this reticulum very minute fibrillæ are given off, and dip into their fibrous tunic. This disposition of the ganglial nerves on the arteries ought to be kept in recollection when we enquire into the functions and diseases of the latter. How far it is necessary, not only to the discharge of the most manifest actions which the arterial system performs, but also to those changes which the blood undergoes in disease, and to the assimilation of the chyle, and other absorbed fluids, I have ventured to state in the article on the Pathology of the Blood. It is evidently to the very intimate connection of this class of nerves with the arteries, and the effects resulting therefrom, that we must impute those changes, whether functional or organic, which take place in the latter, and which influence the state of the blood, and the circulation through them. (*See the* Author's *Appendix to* Richerand's *Physiology*, p. 556. 613.)

6. II. Nervous Affections of Arteries. — II. Class, I. Order (*Author*).

7. There is sometimes disorder referrible to a particular artery, or arteries, evidently depending on an affection of the nerves supplying them. Of this description are, 1st, Neuralgia of the arteries; 2d, The violent pulsations sometimes felt in a large arterial trunk. 1st. Laennec admitted the existence of *neuralgia* of arteries, and considered it to be characterised by acute pain in their course, with increase of their pulsations and the bellows sound; and to be independent of inflammation, as shown by the sudden accession and remission of the symptoms, and their periodic recurrence. That this affection is sometimes connected with irritation, or with an inflammatory state of its nutritious vessels, may or may not be the case; but it is certainly not always so connected.

8. 2d. *Violent pulsation* of arteries is more commonly observed unaccompanied with excessive pain. In these cases a loud bellows sound is often heard in all the principal arteries, particularly those in which the increased pulsation is felt. This affection generally supervenes and disappears suddenly in nervous and debilitated persons, particularly after large losses of blood. Morbid anatomy has not as yet thrown any light on its nature; and therefore we can only refer it to some peculiar influence exerted by the nerves supplying the vessels thus affected, and probably depending originally upon the state of the vital energies of the frame. It is sometimes associated with hypertrophy of the heart. In this case, it is in a great measure to be imputed to that disease.

9. *Treatment of these affections.*—When neuralgic pain is felt in the course of arteries, and is quite unaccompanied by inflammation, the same treatment which is recommended in the article on the *painful affections of* Nerves may be adopted. After morbid secretions and intestinal colluvies have been carried off by purgatives, tonics combined with antispasmodics may be employed. The preparations of iron, the sulphate of quinine, ammonia, camphor, alone or combined with opium, colchicum, belladonna, or prussic acid; the external application of the acetate or muriate of morphine, or the cyanuret of potassium, &c. may be tried. In the cases of inordinate pulsations, unassociated with pain of the arteries, attention to the alvine secretions and excretions, and the use of tonics and antispasmodics, will generally be productive of advantage. As these functional disorders are generally consequent upon disturbance of some internal organ or part, sometimes a distant or remote effect of preexisting disorder, the seat and nature of such disturbance should be investigated, and the treatment directed accordingly. In all such cases, residence in a dry and salubrious air, occasional change of air, gentle and regular exercise, and a light and nutritious diet, will be of much service, (see *Art.* Aorta, § 2—6.)

10. III. Inflammation of Arteries. — Syn. *Arteritis*, or *Arteriitis; Artereitis*, Hildenbrand. *L'Artérite*, Fr. *Pulsader* —, *Arteri* —, *Schlagaderentzündung*, Ger.
Classif. III. Class, I. Order (*Author*, see *Preface*).

11. Defin. *Great and tumultuous vascular excitement, palpitations, anxiety, sense of heat and throbbing in the course of the principal arteries, followed by collapse of the vital energies, and occasionally by gangrene of a limb.*

12. This disease was not entirely unknown to the ancients, as Aretæus makes mention of inflammation of the aorta. But notwithstanding the incidental notice which was taken of inflammation of arteries by Morgagni, and Boerhaave, and afterwards by Grant, the attention of the medical practitioner was never directed to the subject, until J. P. Frank noticed it in a particular manner. It is, therefore, to the last-named author that we are chiefly indebted for the numerous researches of pathologists, respecting it in modern times. Since the appearance of Frank's work, arteritis has received due notice from Testa, Kreysig, Reil, Baillie, Burns, Corvisart, Schmuck, Portal, Scarpa, Hodgson, Travers, Ribes, Laennec, Breschet, Dalbant, Vaidy, Bertin, Bouillaud, Guthrie, Trousseau, and several others, and it is now generally recognised as a specific and most important disease, sometimes occurring primarily, occasionally consecutively and conjoined with other diseases, by no means of rare occurrence, and, in whatever form it presents itself, always threatening the most serious consequences.

13. Pathology of Arteritis.—Arteries, being composed of distinct tissues, may be supposed to be liable to all those kinds of inflammatory action, to which each of their constituent parts are most disposed. However frequently inflammatory action may originate in one rather than in more of the coats of an artery, it seems seldom to continue thus limited, but soon affects the rest to a greater or less extent. It may even seize simultaneously upon all the coats; but this is, I think, of comparatively rare occurrence. The individual tissues of an artery most frequently inflamed, in a primary manner, are the internal membrane of the vessel, and its connecting cellular tissue.

14. Arteritis may be *partial* or *general*, as respects its extension through this class of vessels; and it may present every grade of activity, from the most acute to the most chronic form. It generally attacks one or more of the arterial trunks and larger branches. When it affects the arterial capillaries, it constitutes, in the opinion of some pathologists, inflammation itself; but whether it can be demonstrated as existing in this latter class of vessels, or in what respects it may either differ or agree with inflammation when it does thus exist, are points which have not been yet settled by the few pathologists who have agitated the question.

15. Inflammation may possibly, however, seize upon a number of arterial ramifications in an organ, especially in an unhealthy habit of body, or in a part injured by external violence or excessive cold; but, when it is thus seated, all circulation through the part is quickly interrupted, owing to the effusion which takes place and destroys the permeability of the vessels. The consequences in such cases are, 1st, sphacelus and gangrene of an extremity or part, as we observe in cases of frost-bite; and, 2d, when the inflammation is limited to the capillaries of a circumscribed portion of an organ, particularly when this portion is surrounded by healthy structure, a breaking down of the texture, and its conversion into a fœtid purulent-like matter, as in gangrene of the lungs, and some kinds of abscess formed in the parenchyma of several organs.

16. In constitutions possessing the power to limit the inflammation, which has thus seized upon a congeries of arterial vessels, by throwing out coagulable lymph, the extension of the inflammatory process to the larger branches and trunks is prevented; and, if the part already affected be an extremity, a distinct line of separation is thus drawn, or if it be situated in the centre of an organ, a cyst is thus formed by the lymph effused, tending both to the limitation of the inflammation, and to exclude, as it were, the parts which the loss of circulation has deprived of vitality, from the surrounding living textures, and from the contamination which the defect of this natural partition would allow to take place,

17. When the constitutional powers and vital energy of the vessels of the part are insufficient for the formation of the means of limitation here pointed out, the inflammatory action of the smaller arterial vessels extends itself to the larger trunks; and the affection of these, in addition to the preexisting inflammation of the small branches, increases the mischief; the gangrene extending itself without any line of separation being formed. In this case the constitutional powers fail rapidly, owing to the contamination of the surrounding structures and circulating fluid, from the absorption of the products of inflammation through the venous capillaries of the part, which seldom escape participating in the disease.

18. Such seem to be the results of inflammation affecting a congeries of arterial vessels, or the arterial branches and their ramifications throughout an extremity; and I conceive that those inflammations which are rapidly followed by sphacelation and gangrene, as well as some lesions considered under different heads, and which have been generally referred to the common seat and consequences of inflammation, are of the nature now described. It seems extremely probable that several lesions of a disorganised and disorganising description, following rapidly upon the first developement of deranged circulation, arise from the source now contended for; or, in other words, that some of the consequences usually referred to common inflammation, in conjunction with peculiarity of habit and of the part affected, actually spring from inflammation and obstruction of the arterial vessels, and cannot be otherwise satisfactorily explained.

19. Inflammation of arteries, like inflammations of all other parts, may, however, give rise to effects which will vary according to the degree of intensity of the morbid action, the coat or coats of the vessel in which it originates, or to which it extends, and the habit, diathesis, and constitutional energy of the patient. The duration of this disease, as well as its constitutional effects, will also depend upon the above circumstances; and in inflammation of this part of the system, more perhaps than in the inflammation of any other part of the body, excepting merely the rest of the circulating organs, the primary effects and products of the inflammatory act will be rapidly productive of ulterior effects, serious in their nature and results, even after the morbid action which originated them had altogether disappeared, and could be recognised only in those remoter but palpable consequences, some of which have been alluded to in the preceding paragraphs, and which will be more fully referred to in the sequel, particularly in the section on the morbid structure of arteries (§ 38.).

20. CAUSES.— 1st, The *predisposing causes* of arteritis are generally those of inflammation in general; but those which seem especially to favour the production of this disease, are the gouty and rheumatic diathesis; the middle and advanced epochs of life; certain constitutions of the atmosphere, or epidemic influence; peculiarity of climate, and whatever occasions a diminution of the crasis of the blood, or imparts to it an exciting influence on the vessels; indulgence in the use of much animal food, and vinous and spirituous liquors; a plethoric habit of body, particularly when conjoined to the sanguine and irritable temperaments; prolonged high temperature; intemperate and luxurious habits; the constitutional effects of syphilis or mercury; the suppression of accustomed discharges, particularly the sanguineous; reiterated or prolonged attacks of nervous, convulsive, or spasmodic diseases; and deficient secreting powers of the various emunctories, as the kidneys, liver, &c.

21. 2d. The *exciting causes* of this disease, besides those which are more commonly productive of inflammation, are congelation of parts from great cold, and the sudden exposure to a higher temperature; insolation; punctured, incised, lacerated, or contused wounds; surgical operations; ligatures of arteries after the operation for aneurism (CLINE, ABERNETHY, &c.), or amputation, and from tying the umbilical chord (OEHME); excessive suffering from long-continued operations; continued and fatiguing exertions; sudden and violent muscular action; the sudden extension of a part occasioning the elongation of the vessel and rupture of its internal coat; pressure in the course of arterial vessels; violent fits of passion; great mental emotions; exhaustion of the vital powers; puru-

lent and morbid secretions; animal matters and poisons absorbed into the circulation; chemical agents of any description introduced into the vascular system; and the sudden repulsion or suppression of exanthematous fevers and eruptive diseases. Portal records an instance of the disease which was occasioned by the repulsion of the eruption of measles. I met with an instance of inflammation of the internal membrane of the heart and arteries, in a fatal case of malignant scarlatina, with an imperfect and evanescent eruption on the skin. M. Breschet details several cases in which the disease was consequent upon erysipelas and chronic abscesses. I have found the internal surface both of the arteries and of the veins dark red, and softened, in two fatal cases of puerperal fever, characterised by evident signs of absorption of sanious matter from the uterus. A case also lately came before me of erysipelas followed by gangrenous escars on the sacrum, where the internal surface of the sanguiferous system, and particularly of the aorta and large arteries, as far as they were examined, presented a similar appearance. In all these cases the inspection had been made within eighteen hours after death.

22. The causes of arteritis consist, therefore, 1st, of those which act externally as respects the vessels; and, 2d, of those which irritate in a direct manner the internal surface of the arteries themselves, by being conveyed into the circulating fluid, the properties of which they may have previously changed. But, in whichever of those ways they may act, their first effect seems to be to change or influence the vital energies of the organic nerves ramified to the coats of this system of vessels.

23. 3d. *Anatomical characters.*—As to the particular tissue of the arteries, in which the inflammation originates, I am of opinion that a careful examination of the phenomena of the disease in connection with its causes and complications will warrant the inference, that, when it arises from those causes which act exteriorly to the vessels (§ 21.), and which are chiefly local in their operation, the inflammation is generally limited as to its extent, being confined to a part only of the arterial system, or to two or more considerable branches; that it often affects more than one of the coats of the vessel in this case; and that it generally assumes the sthenic characters, giving rise to those changes which usually result from this form of inflammatory action, such as the effusion of coagulable lymph, forming fibrinous concretions and false membranes in the interior of the vessel, obstructing or obliterating its cavity; red vascular injection, thickening and softening of its tunics; and suppuration, with or without ulceration of its internal membrane.

24. On the other hand, when the disease originates from causes existing within the vessels, and acting through the medium of the blood itself, and more especially when it is complicated with malignant and eruptive fevers, with erysipelas, &c., or is caused by the absorption of morbid secretions, &c. into the current of the circulation, the vascular excitement is rapidly followed by symptoms of an ataxic or asthenic character; the inflammation is chiefly confined to the internal surface of the vessels, but it extends more or less throughout the whole arterial system, and, in many cases, also to the inner lining of the cavities of the heart, and even of the veins. In cases of this description, the lesions of the arteries which it occasions consist chiefly of a dark red or violet-coloured injection of the inner membrane and connecting cellular tissue; great softening and friability of those tissues, with slight sanious infiltration of the walls of the vessel in different parts.

25. It should not, however, be overlooked, that the inflammation of an artery may frequently commence from local causes, and originate in, and be for a time confined to, a particular trunk or its branches, presenting all the signs of the sthenic form of inflammatory action, and yet, owing to causes lowering the vital energies of the frame, or to the absorption of the matters secreted from the inflamed vessel into the current of the circulation, or to both, may pass into the generally diffused and ataxic state of the disease.

26. Symptoms of Acute Arteritis.—These will necessarily vary according to the stage of the disease, the severity and activity of the attack, and the organic changes which the inflammatory action has occasioned in the affected vessels. I shall therefore adduce, *first*, those symptoms which characterise the disease previous to the supervention of those changes which affect this system so as materially to impede its functions, or to change the condition of the circulating fluid; and *next*, those signs which indicate important changes in the state of the vessel, and of the blood itself.

27. The *first stage* is one frequently of much obscurity; and when the inflammation is *limited* to the vessels of a single limb or organ, it is very difficult to distinguish it from the common inflammation of the part. While the internal tunics of the vessels are yet the chief parts affected, and the effusion of lymph into their interior has either not supervened, or not obstructed their canals, the patient generally feels, either after a rigor, or at first alternating with rigors, an increase of the pulsations of the vessels of the part, with a sensation of heat, uneasiness, or pain. When arteritis is more *general*, and particularly if it be connected with inflammation of the heart's internal surface, as occasionally occurs, the symptoms are those of fever of an extremely inflammatory type, as has been remarked by J. P. Frank (*De Cur. Hom. Morb.* t. ii. p. 175.) and M. Bouillaud (*Traité Clin. et Exp. de Fièvres*, p. 175.); commencing in rigors, at first alternating with, and followed by great anxiety, irritability, restlessness, uneasiness, a sensation of burning heat, and remarkable pulsation, with increased sensibility in the course of the large arteries. The patient complains of general and unremitting throbbing throughout the system, sometimes felt more intensely in one part than in another. The surface of the body is hot, tumid, and injected; the tongue red, the papillæ erect, and its base furred and loaded; the bowels are costive; thirst is urgent and unquenchable; the urine scanty, voided with a sense of scalding, and high-coloured; the patient is distressed with palpitations. The pulse at this stage of the disease is strong, tumultuous, throbbing, full, and frequent; and the contractions of the heart hurried and tumultuous. To these are sometimes added cough, occurring in paroxysms, with fits of dyspnœa. When the inflammation extends to the aorta and internal

lining of the heart's cavities, the characteristic symptoms of inflammation of those parts (see AORTITIS, &c.) are superadded to the above.

28. The *second stage* is chiefly characterised by the greater severity of the symptoms, indicating that serious changes are advancing in the internal coats of the vessels, and influencing not only the state of the vital energies of the sanguiferous system, but also the state of the blood. At this period of the disease, the pulse generally becomes extremely frequent, and often wiry, weak, and irregular; whilst the palpitations, anxiety, and paroxysms of dyspnœa increase. The tongue is either dry, the papillæ erect, and its centre furred with a dark mucus or sordes; or it is smooth, glossy, and of a dark tint. The patient is liable to startings and spasms in different parts of the body. The desire for drink increases; the strength sinks; the countenance at first shrinks, is pallid or haggard, but, towards an unfavourable close of this stage, it often becomes somewhat bloated, œdematous, or cadaverous, occasionally injected, and the lips purplish. The extremities are frequently œdematous; and they, as well as other parts of the body, are sometimes affected with wheals, ecchymosis, phlyctenæ, or large vesications. In some cases, effusions of sero-albuminous fluids take place in some of the shut cavities; the surface of the body is covered by a cold perspiration; the extremities become cold, and sometimes of a purplish red colour; and a low muttering delirium appears during the night, from which, at last, the patient is never entirely exempt. To these often supervene a tendency to syncope upon raising the head; irregular palpitations; weak, irregular, hurried, and quick pulse; and a quick, short, and difficult respiration; sometimes orthopnœa and distressing cough. Hiccup and convulsions at last appear, and the patient expires.

29. If the inflammation be seated in large trunks, the serum effused from the internal surface of the inflamed vessel necessarily comes in contact with the circulating fluid; but I believe it does not readily mix with it in persons of a sound constitution, or whose vital energies have not been materially affected, but forms a coagulum, which either sheaths the internal surface of the vessel, partially obstructing it, or altogether filling up its channel. In this case, the symptoms indicate interruption of the circulation through a considerable branch of an artery: the limb becomes œdematous, cold, leucophlegmatic, or purplish coloured, with irregular phlyctenæ and large vesications on its surface, which sometimes go on to gangrene; especially when the disease has extended to the collateral arteries, which, if they had remained unaffected, would have performed the functions of the inflamed and obstructed trunk.

30. When arteritis occurs in a weak or cachectic habit of body, the fluid secreted from the inflamed internal surface of the vessels, owing to the state of the constitutional powers, will not coagulate, but, being of a dissolved and sanious quality, readily mixes with the blood, and no interruption to the circulation through the inflamed vessels occurs: but the energies of life become depressed from the morbid state of the vital current thus occasioned, and many of the symptoms of ataxic or malignant fever manifest themselves; — such as great prostration of the powers of the frame; low delirium; an impeded and morbid state of the secretions and excretions; weak, quick, and irregular pulse; a cadaverous and lurid countenance; accumulations of dark mucous sordes about the tongue and mouth; flaccidity of the soft solids, with the rest of the phenomena described as consequent upon *inflammation of* VEINS.

31. CHRONIC ARTERITIS. — The more acute and active states of arteritis, although frequently admitting only of a doubtful recognition during the life of the patient, are more readily ascertained than the chronic forms of the disease. These latter, however, seem more frequently limited to particular arteries than the acute, and hence oftener produce local effects; but these are generally so slight, and of so equivocal a character, that they commonly escape detection, and are unattended to by the patient until the lesion on which they depend arrives at that degree of advancement which seriously disturbs the functions, and even the vitality, of the part. A very large proportion of the lesions which will be described hereafter (§ 38.) seem to originate in chronic states of inflammation; and, if not actually commencing in these states, they are frequently complicated with them. It will be unnecessary further to notice those symptoms which seem to indicate the presence of chronic arteritis, than to state that they consist of many of the signs already adduced as attendant on the acute forms of the disease, but in a much slighter degree; and frequently no functional lesion can be remarked. When, however, the circulation through the vessel becomes impeded or obstructed, we may infer chronic disease of the arteries, from the inequality or entire absence of the pulsation in these arteries supplying the part whose functions are most affected; from œdema, coldness, discolouration, vesications, or from signs of the gangræna senilis in a limb; or from a feeling of weakness, and a state approaching to paralysis of an extremity or part.

32. COMPLICATIONS. — The states of morbid association of which arteritis forms an especial part have been more frequently disclosed to us after death than recognised during life; nor is it to be expected that, in some of the associations in which it has presented itself, it can be ascertained by the most diligent investigation of the case previous to dissolution. We are still so much in want of faithfully observed cases of the disease, even in its simple and unmasked forms, and of correct information on various topics respecting its history and pathology, as to render our diagnosis imperfect and doubtful; and how much more difficult must be our attempts to recognise it in its complicated forms, when it is masked by other diseases, the phenomena of which obscure it from the observation of the practitioner, and even abstract the attention of the patient himself from the feelings it may awaken. In noticing, therefore, the complications of which this disease often forms a part, it is with the sole view of turning attention to their importance, and in order that the circumstance may receive due consideration, when we give our prognosis respecting those maladies with which it has been found associated, and when we devise means for either their relief or their removal.

33. Inflammation of the arteries has been observed in fatal cases of inflammatory and malignant

fevers, and in those which have been characterised by great vascular excitement at their commencement, with symptoms of ataxy during their progress. In the great majority of such cases, it is a consecutive affection occasioned either by a greater concentration of the morbid action in a particular system, as explained when treating of *fevers;* or by an alteration of the properties of the blood, owing to hurtful materials having accumulated in it from deficient action of the eliminating organs, or to a morbid state of the nervous influence imparted to the blood from the vessels in which it circulates. (See the article Blood.)

34. Owing to similar causes, *arteritis* is sometimes consecutive of *eruptive fevers*, particularly when the eruption, and the morbid evacuation of which it consists, are imperfectly developed or prematurely suppressed; or it may supervene to *small-pox*, occasioning the most dangerous part of the symptoms forming the secondary fever of this disease. In cases of this description, the *arteritis* is almost always general, chiefly limited to the serous membrane of the arteries, but extending also to the same membrane of the veins; and evidently induced by the altered state of the blood, and the presence in it of hurtful materials. To this cause chiefly is to be imputed its occasional occurrence during *erysipelas*, *phlebitis*, and as one of the chief lesions observed in fatal cases of those diseases to which the term *puerperal fevers* has been applied. The complication of arteritis with *phlebitis* is one of the most frequent which occurs. That this should be the case, we might infer from the circumstance of the same causes generally acting upon both divisions of the vascular system, particularly those which act through the medium of the circulating fluid. M. Breschet found inflammation of the internal surface of the veins in a very large proportion of the cases (8 in 13) of arteritis which he has detailed at length in his interesting memoir.

35. Arteritis has likewise been found associated with *inflammation* of the *heart*, with that of the *lungs*, and with *tetanus*, particularly traumatic tetanus. A case of this last complication is alluded to by the writer of an able article in the second volume of the Medico-Chirurgical Review. It has also been observed, although rarely, conjoined with serous effusion into the shut cavities, particularly the pericardium, pleura, and peritoneum.

36. Diagnosis and Prognosis. — It has been very justly remarked by the writer to whom I have already referred, that, until numerous and diversified observations in clinical practice, illustrated by the examination of fatal cases, shall have further enlarged our knowledge of this malady, any attempt to delineate the symptoms which are diagnostic of its presence must necessarily be somewhat imperfect. But it may generally be inferred, — when the principal symptoms which have been enumerated appear — when the heat and pain attendant on this, as on other inflammations, are not concentrated in one part or organ, but are more or less generally diffused, particularly in the course of the arterial vessels — when these sensations are accompanied with an audible or perceptible impetuosity of action, propagated from the large trunks to the smaller and more superficial ramifications — and when, moreover, anasarcous injection of the surface or of the limbs, followed by wheals, vesications, or ecchymosed patches, supervene, — that the disease is inflammation of the arterial system, either in its partial or general form.

37. The Prognosis of arteritis may be said to be, upon the whole, unfavourable, even as respects its more immediate effects, in the acute states of the disease; but chiefly as regards its remote consequences in its chronic forms. The prognosis is more unfavourable when it is complicated with, or supervenes on other diseases (§ 33—35.). The morbid changes which it usually occasions are fully described in the next section of this article.

Before proceeding to offer any observations on the *treatment* of arteritis, I will describe the various changes of structures which arteries present, as the greatest proportion of these changes are produced by inflammatory action in some one of its various grades or states.

38. IV. Morbid Structure of Arteries. 1st, *Lesions of the individual coats of arteries.* — *A. Redness* of the inner membrane of arteries is often observed in post mortem examinations. *a.* It seems to proceed from *three* causes: 1st, from the imbibition of the colouring particles of the blood remaining in the vessels, being entirely the consequence of death, and the result of incipient decomposition; 2d, from a change in the state of the blood occurring in the course of the disease which occasioned death, and existing some time before this event; and, 3d, From a morbid or *injected* state of the capillaries ramified in the coats of the vessel, or terminating in this membrane. In an epidemic amongst horses, which occurred at Paris in 1825, characterised by symptoms of disease of the thoracic viscera, no morbid appearances were found in the lungs, but the internal membrane of the large vessels was uniformly red, and the muscular structure of the heart remarkably softened. From the experiments of Gendrin (*Hist. Anat. des Inflam.* t. ii. p. 9.), it is evident that the same varieties of colour, which we occasionally observe in arteries after death, may be produced by artificial irritation. There is, however, this important difference, — that when their redness is produced artificially, it is accompanied by other alterations of tissue, such as softening, serous or purulent infiltration, &c.; whereas, in almost all the cases where the arteries have been found of a red colour throughout, the change was unattended by any other morbid appearance in them. I believe that this coloration of the internal membrane of the arteries, as well as of the cavities of the heart, is more frequently owing to a morbid condition of the blood itself, than to any inflammatory change in them. This opinion is confirmed by the circumstances and states of disease in which it commonly occurs; these chiefly consisting of depressed vital energies, deficient secreting power, and a consequent morbid condition of the blood itself.

39. *b.* The internal membrane of arteries sometimes loses its *tenuity* and natural *transparency*, either in a few isolated points merely, or through a great extent of its surface. This state may amount to considerable *thickening* and *opacity;* but in many cases these appearances do not depend upon any remarkable change in this mem-

brane, but upon an albuminous exudation in its connecting cellular tissue.

40. *c. Softening* also takes place in this membrane, which is sometimes so friable as to be reduced to a pulpy mass by the slightest scraping with the scalpel. Possibly, owing to this state of the inner membrane, its *laceration* may take place upon stretching the vessel by the more violent motions of the body, or of a limb.

41. *d. Rupture* or laceration of the internal coat of an artery is sometimes met with: it necessarily occasions an effusion of lymph from the lacerated part, and the projection of the flaps of the divided coat into the canal of the vessel, either partially or entirely obstructing it. To this occurrence is chiefly to be imputed the cases of spontaneous obstruction of arteries, which are sometimes met with. This subject has been well illustrated by Mr. Turner, in the third volume of the Transactions of the Medico-Chirurgical Society of Edinburgh.

42. *e. Ulceration* of the internal membrane of arteries is not infrequent. The ulcers are generally round; occasionally one only is to be found. Sometimes the large arterial trunks, and particularly the aorta, are studded with them. But this is rarely observed, unless other alterations exist in the subjacent tissues, such as ossification, softening, &c. M. Bouillaud is of opinion that the ulceration of the inner coat occasionally admits of cicatrisation.

43. *B.* The middle coat is more frequently diseased than the internal. It is often *soft* and *friable*, and deprived of its natural elasticity; giving rise to serious modifications of the functions of the circulating system. M. Andral has found this coat remarkably *hypertrophied;* the yellow fibrous tissue of which it is composed being as evident in the human subject as it is in the horse. This change may be confined to particular parts, occasioning irregularities in the diameters of the arterial canals, or it may extend throughout a whole artery. The fibrous coat may also become *atrophied*. In this state it approaches to the appearance of cellular tissue, and is much thinner, resembling the tunic of veins; and the artery loses its elasticity and collapses when divided. This coat may also acquire much rigidity, and be transformed into *cartilaginous* or even *osseous* rings, embracing the whole circumference of the vessel. This change is rarely met with in the aorta, but it not infrequently occurs in large arterial trunks, as the femoral artery, &c. *Ulceration* may extend to and penetrate this coat, most frequently advancing from the internal membrane.

44. *C.* The external or cellular coat of arteries is liable to fewer alterations than the other coats; it often remains sound when they are extensively diseased, when it has alone to sustain the column of blood injected through it. But it also frequently participates in the changes of the other coats, becoming *ruptured* from the pressure of the stream of blood thrown into it, and more rarely *ulcerated*.— The foregoing changes of the individual coats of an artery combine to affect its functions and condition, and give rise to important alterations of its structure and of its calibre, which may be increased, diminished, or entirely obliterated. Each of these requires a separate but brief consideration.

45. 2d, *Changes of the structure and calibre of arteries.* — *A.* Aneurism. *a. True aneurism, or dilatation of arteries* occurs; 1st, in a *part* only of its circumference, and, 2d, in its *entire* circumference: the latter is the more frequent occurrence of the two: it may embrace but a small extent of the vessel, or it may extend to a considerable portion; as, for instance, to nearly the whole of the aorta. Dilatation of a part only of the circumference of an artery is rare, but certainly not so rare as to warrant some authors in disputing its existence. M. Andral states, that on more occasions than one he has traced distinctly the three arterial coats passing over the walls of a sac which seemed as if appended to the artery, with the cavity of which it communicated. Dilatation either of a part, or the whole, of the circumference of an artery, constitutes the *true aneurism* of authors; and according to its extent it may constitute *simple dilatation*, or true aneurism in its first stage, and *sacculated aneurism*, or the advanced state of this disease.

46. The coats of a dilated portion of artery, although not ruptured, may be otherwise altered. They are frequently thinner than natural, and the middle coat is generally deprived of its elasticity. In this state the vessel yields like a vein to the distending impetus of the blood. In other cases, the coats of the dilated portion of artery are hypertrophied. M. Andral likens this state to the dilatations of the stomach and heart, which are often accompanied with an increased thickness of their parietes.

47. *b. False Aneurism.*— *Mixed aneurism.*— *Dilatation with rupture* of one or more of the coats, constituting the *false aneurism* of authors, is another frequent alteration. The internal and middle coats are those most frequently ruptured, the blood coming in contact with the external or cellular coat or sheath, dilating it in the form of a pouch, and thus forming the aneurismal sac. The parietes of this sac are generally much thicker than the cellular sheath of the vessel was originally, owing to the gradual condensation of the surrounding cellular tissue from the pressure of the tumour, and the additional envelope it thus acquires. The interior of the sac is filled more or less with fibrinous coagula, arranged in concentric layers, the more exterior of which frequently become so dense as to be distinguished with difficulty from the parietes of the sac. Around the exterior of the sac a degree of irritation is induced, giving rise to adhesions, which unite it more or less firmly to the surrounding parts. But these parts suffer other changes, particularly as the aneurismal tumour increases: they are mechanically compressed or displaced; or they are worn away by absorption promoted by its pulsations, or by inflammatory irritation terminating in ulceration and destruction of parts. This effect upon the adjoining structures has been shown under the article Aneurism of the Aorta, and it is therefore unnecessary to illustrate it further. According to some authors, *false aneurism* consists of the ulceration or perforation of the internal coats, and of the dilatation of the external tunic only; the changes above described constituting *mixed aneurism*.

48. *c. Diffused aneurism, &c.* — In general the irritation created around the sac attacks, after a time, the sac itself, occasioning its ulceration and

perforation. Hæmorrhage is then the result, which may be so great as at once to occasion death. It is frequently arrested by the anatomical relations of the part: as when blood flows into the pericardium; or when the blood passes into the parenchyma, or loose cellular tissue connecting different organs or structures; in which case it passes into the state of *diffused aneurism.* In some cases the hæmorrhage is arrested by adhesions formed around the sac, constituting a second envelope to it, which confines the blood, and prevents it for a time from being further effused. Perforation of the sac, however, may take place without hæmorrhage, or even the production of diffused aneurism. This happens when a part in contact with the sac supplies the place of that portion of its parietes which has been destroyed, and affords sufficient resistance to the escape of the blood. Thus we have seen that the blood, in aneurism of the AORTA, may actually wash the partially destroyed vertebræ, no effusion taking place till still further destruction is occasioned; and the tumour, in other cases, coming in contact with the periosteum, produces thickening of this structure, or the secretion of an osseous matter from it which partially surrounds the sac, forming an envelope to it, and preventing the escape of its contents until this also is destroyed.

49. In *false* and *mixed aneurisms*, the inner and middle coats are first perforated or ruptured, and the *third* coat either remains entire, or gives way at some remote period, and thus a *secondary diffused aneurism* is formed (§ 48.). But there is another form of diffused aneurism, in which all the coats of the vessel are ruptured or perforated at once, and the blood, passing entirely out of the vessel, forms no sac, but is diffused in the adjoining parts; or it impacts the cellular and parenchymatous structure in its vicinity into a species of sac or envelope; or it is poured out into a shut cavity, or into some organ, whence it may be discharged externally, thus constituting *primary diffused aneurism.* In the majority of cases, however, the aperture in the artery is the result of ulceration of one or more of the coats of the vessel, the remaining tunic giving way before the impetus of the circulation; the blood being either confined by the surrounding parts, or escaping into a cavity, according to the situation of the artery, and of the aperture in it. This perforation and rupture of all the coats occur chiefly in the arteries of internal viscera, as in the splenic, hepatic, emulgent, iliac, and other arteries.

50. Aneurisms may *terminate favourably*, a spontaneous cure being sometimes effected by some one of the following processes: — 1st, by a gradual contraction of the sac, and absorption of the coagula; 2d, by the compression exerted by the sac upon the part of the artery immediately above it; 3d, by gangrene of the sac and obliteration of the artery; 4th, by inflammation or abscesses in the vicinity, and the coagulable lymph thrown out, obliterating the artery, as in the preceding case; and, 5th, by inflammation of the sac extending to the artery, and giving rise to adhesive inflammation of its interior, and ultimately to its obliteration.

51. *B.* NARROWING of arteries is either congenital or the effect of disease; when the latter, it is very frequently associated with, or occasioned by, ossific deposits,— a change which will be considered in the sequel. It is chiefly in the aorta and large vessels departing from it that we meet with either congenital or morbid narrowing. *Congenital* contraction of the aorta is generally connected with extreme thinness of its parietes, and in some cases this defective developement has been so remarkable that the abdominal aorta has not equalled the usual size of the external iliac artery.

52. The contraction of the aorta, or of an arterial branch, may exist throughout its extent, or may be confined to a particular part. The abdominal portion of the aorta is more frequently contracted (see AORTA.) than the thoracic; and when the former is narrowed, the latter is often dilated. Sometimes, however, the artery retains its natural calibre both above and below the constricted part: instances of this have been recorded by M. PARIS, in the second volume of DESAULT'S Journal, and by M. REYNAUD (*Journ. Hebd. de Méd.* t. i. p. 161.). In many cases of constriction such as I have now noticed, it is difficult to determine whether this change has been congenital or the result of disease, inasmuch as the coats of the vessel have appeared unaltered from the healthy state. But there can be no difficulty in determining in favour of the latter alternative, when the coats of the contracted portion are thickened, or contain ossific deposits, or are otherwise changed. When the contraction is the result of disease, it is sometimes very remarkable, the canal of the vessel being nearly obliterated. The narrowing found in the principal trunks or branches of arteries is almost always the result of inflammatory disease; most commonly of ossific deposits, or of chronic inflammation.

53. *C.* OBLITERATION of arteries is frequently observed. This lesion may occur in any part of the system, even in the aorta itself, but it is most commonly met with in the second or third order of arteries. The smaller branches may also be obliterated; but they less frequently become the objects of examination than the larger trunks. The canal of an artery may be obliterated, 1st, by fibrinous coagula adhering firmly to the parietes of the vessel, or incorporated with them; 2d, by the conversion of the vessel to a ligamentous chord; 3d, by osseous concretions, or other morbid growths, filling entirely its cavity; and, 4th, by the advanced progress of aneurism to a spontaneous cure.

54. *a.* The *first* species of obliteration has been found in the aorta by Professor MONRO (*Edin. Journ. of Med. Science*, vol. ii. p. 351.); the part affected being somewhat contracted and filled up by a plug of fibrine, which adhered to the surface of the vessel by coagulable lymph. This form of disease is common in the arteries of the extremities, particularly the lower, and is sometimes owing to the rupture of the internal coat of the vessel. It occurs also in cases of gangræna senilis, and, with the *third* species (§ 56.), is a frequent cause of the gangrene. It seems most probable that it is a more immediate consequence of inflammation than the *second* species.

55. *b.* The *second* form of obliteration is not uncommon in large branches of arteries, and has been found, in two cases, in the aorta: it is evidently a more remote cause of inflammation than the foregoing. The circulation being entirely ob-

structed, by the coagulable or fibrinous lymph poured out by the inflamed or ruptured internal membrane, and by the coagula thus formed, and being kept up by the enlargement of collateral branches, the obstructed part is deprived of its functions, and subsequently undergoes those changes which all vascular or other canals experience when they no longer are pervious to the fluids which usually circulate through them, — they have the fibrinous coagula, which have been formed in their cavities, and the lymph effused between their coats, absorbed, and their coats become condensed into ligamentous chords.

56. *c.* The *third* species has been met with in the aorta by Dr. Goodison (*Dub. Hosp. Rep.* vol. ii. p. 193.), and M. Velpeau (*Rev. Méd.* 1825, t. iii. p. 326.) In Dr. Goodison's case, an osseous deposit surrounded the canal of the vessel, which was completely filled at this part with a dense fleshy and fibrinous mass, resembling the structure of the heart. A similar obliteration also existed in the iliac arteries. In M. Velpeau's case, the obliteration was owing to the formation of a scirrhous or carcinomatous tumour in the vessel, resembling similar tumours developed in different parts of the body. Obliteration by polypous or other growths, by fibrinous coagula and coagulable lymph, by ossific deposits, &c. are also found in large arterial branches, especially in those supplying the lower extremities. The obliteration of the arteries by ossification is one of the principal causes of the gangrene of aged persons. When a considerable artery, or even the aorta, becomes either much obstructed, or entirely obliterated, in any of the above ways, the circulation is generally carried on by enlarged collateral vessels.

57. *d.* The *fourth* species has been observed in several large arterial trunks. Dr. Monro's case of obliteration of the aorta may be partly ascribed to this cause; the coats of the vessel, although entire, being dilated below the constricted part.

58. *D.* Albuminous and purulent matter. — M. Gendrin (*Hist. Anat. des Inflam.* t. ii. p. 9.) has clearly proved, by his experiments, that, when an artery is artificially irritated, its parietes soon become injected, swollen, softened, and infiltrated by a serous fluid; its internal surface is coated by an *albuminous exudation*, and *collections of pus* form, either in the interior of the vessel, or between its coats. He has, moreover, demonstrated that, if the artery continues full of blood during the experiment, this fluid is coagulated, and altered in a variety of ways by the morbid secretion poured into it from the internal surface of the inflamed vessel. Similar appearances have been observed from disease, particularly in the aorta and large arterial trunks, where they are most obvious. Mr. Hodgson and M. Bouillaud found the internal surface of the aorta lined with a perfect *false membrane*; and when this was removed, the surface of the vessel was of a bright red colour. M. Andral has observed the internal membrane of the artery raised by small *abscesses*, sometimes as large as the size of a nut, situated between the internal and middle coats. It is probably to the bursting of those into the vessel that ulceration of the internal tunics is owing. Pus is also sometimes found in the interior of arteries, either unmixed with the blood, or mixed with it and altering its appearance.

59. *E.* Atheromatous matter is frequently found between the inner and middle coats of arteries. It was first noticed in this situation by Monro and Haller. It is generally of the consistence of suet, of a cheesy opaque appearance, is greasy to the touch, with minute gritty particles thinly scattered through it. In some cases it resembles more nearly a semi-concrete pus, and seems to result from the changes which pus may have undergone subsequently to its secretion. In other cases the atheromatous matter abounds in gritty particles, which occasionally even exceed the suety part; and the deposition thus passes into the form of a calcareous concretion. It is extremely probable that these varieties of morbid formation are connected with chronic inflammatory action of the coats of the vessel.

60. A variety of the atheromatous matter has been described by Morgagni, Scarpa, Stentzel, and Craigie, under the denomination of *steatomatous* deposition. The name, however, as Dr. Craigie has remarked, is not well chosen, inasmuch as this formation is not adipose, but a firm cheesy or waxy matter, of a yellowish or fawn colour. It seems merely a more concrete variety of the foregoing, and differing from it chiefly in the absence of gritty particles. It is more frequently found at the bifurcations of arteries, but it is not limited to those situations; and is generally deposited between the inner and middle coats. When the quantity of this matter is considerable, it encroaches on the calibre of the vessel. This substance is met with either alone, or with patches of calcareous deposit. It probably derives its origin from a similar source to the atheromatous matter; and, according to Scarpa, always terminates in ulceration: but this is not invariably the case, as it has been observed, particularly when unattended with calcareous formations, distending the coats of the vessel to a great extent without any ulceration. This change, however, takes place very generally, either when the deposition of this matter is considerable, or when associated with calcareous formations. When ulceration takes place, the coats of the vessel are soon destroyed to a greater or less extent, and rupture follows; taking place, as shown by Mr. Hodgson, in a transverse direction to the axis of the vessel, and giving rise to extensive or fatal hæmorrhage, or to circumscribed or diffused aneurism, according to the situation of the aperture in the vessel.

61. *F.* Calcareous *or osseous concretions* are the most frequent morbid appearances presented by arteries. These concretions, however, differ from healthy bone chiefly in wanting the fibrous structure, in not being necessarily deposited in a cartilaginous matrix, in consisting of a larger proportion of phosphate of lime, and less animal matter, and in presenting an irregular, homogeneous, and unorganised appearance. Bichat and Baillie considered that the larger proportion of persons above sixty years of age have some part of the arterial system affected by these formations. This change is very seldom observed in early life. Young found it, however, in an infant; Wilson in a young child; and Andral in the aorta of a child of eight years of age. M. Andral has met with ossific laminæ in the aorta, in five or six persons of from eighteen to twenty-four years of age: and an extensive ossification of the

superior mesenteric artery of a person not quite thirty. This species of formation always is seated between the muscular coat and the internal membrane, which it often detaches from its connections; and it originates either in the atheromatous matter described (§ 59.), the place of which it sometimes takes; or in those whitish patches already noticed, which apparently consist of an albuminous exudation formed between the inner and middle coats, and which pass from the albuminous, first to the cartilaginous state, and subsequently to that of bone.

62. *a*. But this is not the only change which the vessel undergoes; for, whilst the calcareous deposits are going forward, the middle coat becomes either hypertrophied, thus contributing to the thickened appearance which the vessel sometimes presents, or atrophied, being apparently replaced by the calcareous concretion, and leading to the mistaken opinion that this coat itself has been transformed into bone. The osseous concretions exist in various forms: sometimes they consist of minute grains; at other times of irregular plates of different sizes; occasionally they incrust the the artery and convert it into an inflexible tube; and, more rarely, they give the sensation of a number of small bodies moving on each other, and as if jointed together.

63. The ossific concretions may be very considerable, without in any way changing the calibre of the vessel, or even its form; or they may project into it so considerably as to obstruct, or even to obliterate its canal. They thus occasion *gangræna senilis*. It has even been supposed, — and the opinion is very probable, — that they may project through, or penetrate, the internal membrane, and fall into the cavity of the vessel; and, being conveyed onwards with the current of blood until they arrive at arteries of smaller calibre, may thus completely obstruct them. The *calcareous concretions* found in some rare instances plugging up the canal of the vessel, evidently are produced in this way.

64. *b*. As to the *comparative frequency* of this lesion in various arteries, I may add a few remarks, derived from the interesting materials supplied by M. ANDRAL (*Anat. Path.* t. ii. p. 395.). The aorta is the most liable of any to ossification in some part or another; but every one of the branches proceeding from it may likewise be the seat of this change. The coronary arteries are frequently ossified, both in their trunks and in their subdivisions. The large vessels which arise from the arch of the aorta often present at their origin a bony ridge projecting into their interior. The cerebral arteries of old persons are frequently found studded with cartilaginous and osseous laminæ; and M. BOUILLAUD has shown that this change disposes remarkably to apoplexy with sanguineous extravasation. Ossification is very common in the splenic artery, but exceedingly rare in the hepatic, and coronary artery of the stomach. A bony ridge is often found at the origin of the common iliacs. The arteries of the lower extremities are not infrequently the seat of these concretions; and they sometimes occur in the radial artery of aged persons. M. ANDRAL has never met with this alteration in the hypogastric artery. HALLER met with it once in this vessel (*Opusc. Path. Obs.* 59.); and this is the only case of the kind on record. — All the morbid depositions described above have been found in the pulmonary artery, but much more rarely than in the aorta and vessels proceeding from it.

65. *c*. *Origin of osseous formations in the arteries.* — The ossification of arteries has been ascribed by many authors to slight chronic inflammatory action. The experiments of M. RAYER and M. CRUVEILHIER seem to confirm this inference, as an occasional occurrence at least, particularly in the fibrous and cartilaginous structures: increased vascular action of those structures, artificially excited, being generally followed by ossiform depositions; but, in a number of cases, particularly in those where the deposit takes place in the cellular tissues, no inflammatory action can be detected previously to this change: besides, increased vascular action frequently exists, without being attended with ossiform depositions. This lesion, therefore, cannot be algether ascribed to this cause, although frequently resulting from it, in a certain order of tissues. It would be more correct to consider it merely as a consequence of disorder of the natural process of nutrition and secretion, frequently induced, in particular tissues, by a chronic state of inflammatory action. But to what cause is this disorder of the nutritive function to be imputed, particularly when it occurs in parts which have not evinced any sign of inflammatory action, as in the cellular tissue connecting the internal coats of arteries? The importance of this enquiry may appear from the very great proportion of persons, in advanced years, who are affected, in some organ or tissue, with this lesion, and from the remarkable part it performs in the production of a number of diseases of the most dangerous description.

66. In answer to this, M. ANDRAL very plausibly observes, that physicians have frequently noticed the existence or succession of three different forms of calcareous productions in persons of a gouty diathesis: 1st, gravel and urinary calculi; 2d, hard concretions in the small joints; and, 3d, ossiform productions in the arterial system, and other parts. Is it not, therefore, probable that morbid ossification proceeds from a similar cause to those other calcareous formations? We have seen that gout generally originates in an excessive use of animal food, conjoined with deficient assimilative and secreting powers of the frame. The highly azotised blood of a person thus circumstanced becomes surcharged with urea and phosphate of lime, as evinced by the state of the urinary secretion, which always, in such cases, abounds with uric acid and the earthy salts. The experiments of M. MAGENDIE have proved, that by changing the diet of a person who has been living chiefly upon animal food, and by substituting substances containing no azote, the uric acid and phosphates disappear from the urine. May we not, therefore, infer that in consequence of the excessive use of animal food, conjoined with imperfect assimilative and secreting powers, these substances will accumulate in the blood to a hurtful extent; the urinary organs being unable to eliminate them entirely from the circulating fluid? The necessary result of this state of the blood will be, that these substances will occasionally be deposited in other parts, giving origin to the uric acid concretions

found in the small joints, and to the phosphate of lime deposits found in the arterial system and some other parts. From this it will be apparent that the ossific formations met with in the arteries are derived from a similar origin to that which has been more fully explained under the articles, GOUT, and URINARY CALCULI. The increased vascularity, observed frequently to co-exist with the morbid secretion of calcareous matter, may proceed from the irritation produced in the capillaries by the morbid matters circulating in them; or it may be a necessary attendant upon the secretory process, especially when this process is of a morbid description; or the accidental occurrence of irritation and increased vascular action in the interior coats of the vessel may prove the determining cause of the ossiform deposit, to the formation of which a disposition had previously existed, owing to the excessive abundance of the phosphates in the blood. If this explanation of the origin of ossification in the arteries be correct, a rational method of preventing and combating this lesion is presented to us for adoption.

67. TREATMENT. — *A.* The more *acute states of arteritis* require the same general principles and details of treatment as inflammations of other parts. General and local depletions, calomel, and oleaginous purgatives, cathartic enemata, diaphoretics consisting chiefly of camphor, antimony, and opium, &c. (F. 39. 184. 358. 460.); cooling diluents, and the rest of the antiphlogistic regimen, are indispensably requisite. After a copious depletion, practised so as not to occasion full syncope, the following will be found of service in preventing the re-accession of increased vascular action.

No. 33. ℞ Camphora rasæ gr. iij.—v.; Pulv. Jacobi Veri gr. v. (vel Antimonii Tartar. gr. ss.); Calomel. gr. xii.; Opii Puri gr. ij.—iij.; Conserv. Rosar. q. s. ut fiat Bolus, statim post venæsectionem capiendus.

68. In the more *acute states* of arteritis, *digitalis*, and emollient diluents, with nitrate of potash, or the vegetable acids, may be exhibited. After depletions have been carried as far as may be considered prudent, and when there exists no constitutional vice contra-indicating the practice, the mercurial preparations may be given to the extent of affecting the gums. The repetition of the bolus now prescribed will generally be sufficient for this purpose, the bowels having been well evacuated previously. In this form of arteritis, HILDENBRAND recommends (*Instit. Med.* t. iii. p. 26.) cold epithems over the seat of the inflamed vessels, the internal use of lemon ices, and the cautious exhibition of the *superacetate of lead* and opium (F. 206.), after depletions have been practised. *Colchicum* may also be given, or substituted for digitalis; but these medicines require great caution in their exhibition, particularly after large depletions, and when antimonials precede or accompany them. The *diet* ought to be very low, cooling, and chiefly farinaceous; and, during recovery, the more heating kinds of animal food should be abstained from. During the disease, as well as during convalescence, *perfect tranquillity* of body and mind should be insisted on.

69. In some states of acute arteritis, it may not be advisable to lower the powers of life too much; as we may thereby risk the occurrence of arterial throbbings, the extension of disease along the internal membrane of the vessel, and the vitiation of the circulating mass by the secretion poured into it from the inflamed surface. The tendency also to limit the inflammation by the formation of coagulable lymph, when the period of resolution is past, may also be overcome by too great depression of the vital energies, which ought therefore to be supported in extreme cases, and not depressed too low in others.

70. *B.* The more *chronic states* of arteritis require cooling purgatives, occasional depletions, and a low refrigerant diet and regimen. A vegetable, particularly a farinaceous diet, is extremely serviceable in these states of the disease, chiefly by preventing the consequences to which they usually lead. The richer and more stimulating kinds of animal food, and particularly pork, should be constantly avoided, and all tendency to plethora suppressed or subdued. In the chronic as well as the acute diseases of arteries, physical and moral tranquillity is particularly required. The abdominal secretions and excretions ought to be duly examined and regulated, undue sinking of the vital energies prevented or counteracted, pure air prescribed, and due attention paid to the first indications of disorder of the digestive functions.

71. *C.* The *consequences* of inflammation of arteries, whether those more palpable changes which constitute the different kinds of *aneurism*, or those which are merely matters of more doubtful inference, can be treated only upon the above principles: above all, vascular plethora must be avoided, and tranquillity observed. There is, however, one fact, which, I consider, should not be lost sight of by the practitioner, and which is the result of attentive observation; namely, that, even in aneurism, more mischief than advantage will be derived from depressing the vital energies of the frame too low, than from observing a more moderate, or rather a less vigorous, mode of treatment. When carried too far, relatively to the circumstances of the case, those guards which the restorative powers of the frame set up against the extension of the disease are thrown down; the destruction of adjoining parts extends; the fibrous coagula which fortify the weakened parietes of the vessel, and tend even to a spontaneous cure of the disease (§ 50.), assume, as Mr. GUTHRIE has very justly remarked, a loose and spongy state, and allow the blood to pass through it, or between it and the coat or coats of the vessel; and the disease, consequently, makes rapid progress. There can be no doubt, as hinted at by this eminent surgeon, that the extension, and ultimately the bursting, of aneurisms, are not altogether owing to the impetus of the blood in the vessel; and that, therefore, the treatment which is solely directed to this point must be deficient. The suggestions now offered (§§ 69, 70.), as well as those stated in the article on ANEURISM of the AORTA, will be sufficient to guide the practitioner in this respect.

72. *D.* The *complications* of inflammations of arteries, and their consequences (§ 32. *et seq.*), require attention to the fact, that, when arteritis supervenes in the course of other diseases, it is generally during those stages which are characterised by depression of the constitutional powers, when the circulating fluid becomes materially changed from its healthy condition, and most

probably loaded with an unusual quantity of unassimilated, morbid, or irritating materials. Indeed, these are the circumstances which favour the occurrence of all inflammations affecting the different circulating systems — the lymphatic as well as the venous; and they account at the same time for the very frequent association of *arteritis* with *phlebitis*, particularly in the last stages of febrile and eruptive diseases. These considerations naturally suggest the propriety of having recourse to such measures as may be best suited to individual cases for the prevention of inordinate depression of the energies of life, during the advanced stages of diseases, when we fear the supervention or the existence of arteritis; or as may support those energies, whilst we excite the organs whose functions are chiefly to eliminate irritating and hurtful matters from the circulation. By thus opposing too great depression, further deterioration of the blood is more likely to be prevented than by any other indication of cure; whilst the removal of the cause, — the source of irritation of the internal surface of the vessels, — presents a probable chance of the disappearance of its effects. (See Aorta — *Diseases of*.)

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ARTHRITIS. (See Gout.)

ARTS and EMPLOYMENTS. — 1. Pathology. — *Etiology.* —An enquiry into diseases caused by the prosecution of the various arts of civilised life is of the utmost importance to the scientific professor of medicine in all countries, but particularly in this; for in no other country are the useful arts so extensively prosecuted as in Great Britain. The great importance of the subject has been acknowledged by the success of the able works of Ramazzini, Merat, Patissier, and Thackrah, on the diseases of artisans.

2. As it would be foreign to my plan to take into consideration at this place the diseases occasioned by the numerous arts which furnish employment and subsistence for a very large part of the population of this and many other countries; particularly as these diseases will be considered in their more important relations in other places, and many of them under distinct articles; I will here confine myself to a succinct account of the effects which the prosecution of the various useful arts directly or indirectly produce in the frame; interspersed with a few remarks as to their influence in modifying the characters of various diseases, and as to the means by which their injurious effects may be partially prevented or counteracted.

3. In offering these observations, I will only, in some respects, observe the arrangement adopted by Ramazzini, and closely followed by Fourcroy and Patissier. This arrangement is founded on the nature of the causes producing the diseases to which artisans are liable. The First Class of causes consists — 1st, Of *confinement, and insufficient ventilation*; 2d, Of *undue exertion*; and, 3d, Of *sedentary habits*. The Second Class comprehends — 1st, *Undue exertion of particular parts, and insufficient exercise of other parts*; 2d, *Unnatural or constrained positions in different employments*; and, 3d, *Temperature and moisture*. The Third Class embraces those causes which consist of material molecules, and which, coming directly or mediately in contact with the body, in the state either of vapour or of minute disintegration, penetrate the organs, and disorder their functions. These are — 1st, *Mineral molecules*; 2d, *Vegetable molecules*; 3d, *Animal molecules*; and, 4th, *Mineral and vegetable molecules* acting mechanically. On the operation and effects of each of these, as being intimately connected with the nature, complication, and removal of diseases, I proceed to offer a few remarks.

4. I. Class first. 1st, *The hurtful influence of confinement, and of insufficient ventilation*, is great in proportion to the youth or early years of those who are thus circumstanced. In the majority of factories, artisans are congregated in great numbers, necessarily confined during the greater part of the day in the same apartment, which, being usually warmed by artificial heat, — by pipes conducting heated air or steam, — have not the air renewed with that rapidity which necessarily obtains in apartments provided with the fire-places in common use. The consequences are, that those confined in them breathe an impurer air than under ordinary circumstances; and experience the debilitating influence occasioned by an atmosphere loaded with an increased quantity of carbonic acid gas and animal effluvia.

5. Persons who have already attained to their full growth, and those particularly who have nearly reached the meridian of life, seldom experience the deleterious effects of confinement under such circumstances, to nearly the same extent as those in early life. When the subject was brought before parliament by Sir Robert Peel, Mr. Owen of New Lanark stated, respecting the children employed in his manufactory, that, although they were extremely well fed, clothed,

and lodged, looked fresh, and, to a superficial observer, were healthy in their countenances, yet their limbs were generally deformed, their growth stunted, and they were incapable of making much progress in the first rudiments of education. This statement, which appears to have been made as a result of large experience, agrees with the observations of other able men. The evidence of Sir Astley Cooper is even still more decided, and is perfectly in accordance with the experience of every competent judge. The result of confinement, this eminent surgeon states, is not only to stunt the growth, but to produce deformity. Every traveller in countries, the population of which consists chiefly of those whose avocations bring them much in the open air, or in agricultural districts, must have remarked not only the much more fully developed frames, and larger lower extremities, of the inhabitants of those parts, but also the more phlogistic or inflammatory characters of their disorders, and their greater vital resistance and powers of restoration when exposed to the causes, or suffering from attacks, of disease, than are manifested by the inhabitants of crowded manufacturing towns.

6. Not only is confinement in itself detrimental to the frame, particularly during the epochs of developement of the various structures of the body, when air and exercise are nearly as requisite as food to their perfection, but the construction of the apartments, the want of ventilation, the accumulation of animal effluvia, and the moral depravation consequent upon continued assemblages of persons, little under physical or moral control, essentially increase its injurious effects, and co-operate with it in impressing an asthenic character on the frame; in disposing to the formation of tubercles, and to the strumous diathesis; in depressing the vital energies and mental manifestations; and, consequently, in disposing the body the more to the usual exciting causes of disease, and the mind to vicious habits and indulgences.

7. 2d, *Over-exertion* is a very frequent cause of disease among many artisans; and, like confinement, it is the more injurious, the earlier in life it comes into operation. In the lower animals, particularly in the horse, the consequences of over-exertion are fully manifested. This animal seldom reaches one half of its natural life as employed in this and many other countries. As to effects of over-exertion on man, much will depend upon his habits and modes of living. When well fed, and of regular habits, its injurious consequences are neither so great, nor so soon appear, as when he is poorly fed or addicted to the use of spirituous liquors.

8. Over-exertion shortens life, 1st, by injuring the continuity, cohesion, or relative situation of various parts; 2d, by inducing that degree of exhaustion which runs on to irremediable or fatal disease; and, 3d, by that gradual and insensible expenditure of vital influence, beyond the power of reinforcing it, whereby the mean duration of human life is shortened. The trades which chiefly illustrate the above positions are coal-heavers, navigators or ballast-dreggers, smiths, miners, &c.

9. It should not be overlooked, that in many trades the artisan is not only subjected to confinement in close and imperfectly ventilated apartments, but is at the same time obliged to overexert his physical powers. In such cases the ill effects are necessarily greatly augmented; more especially in children or very young persons, who are naturally impatient both of confinement and over-exertion; and in them particularly are the injurious effects, moral as well as physical, chiefly manifested. Many of those who become the most drunken, immoral, or feloniously depraved, have been initiated in vice from the associations formed in factories.

10. 3d, *Sedentary habits* are also adverse to health, but only in a negative manner, as respects persons living in well ventilated and wholesome situations. The simple neglect of due exercise, however, is after a time generally productive of disease, owing both to its effects upon the nervous and muscular energies — the manifestation of all our functions being improved by a moderate exertion of them — and to its influence on the secretions and excretions, which require a certain degree of muscular exercise for their promotion. Literary men suffer in a particular manner from want of bodily exercise, chiefly owing to the over-exertion of the mental powers, the bent position of the trunk, and the stagnant air of close apartments. Clerks, and various artisans, suffer also from the same cause, particularly tailors, shoemakers, watchmakers, weavers, jewellers, &c. In some of these the pressure made upon the lower part of the sternum and stomach proves very injurious.

11. Mr. Dobson furnishes very instructive information as to the effects of confinement to a particular posture and in a close atmosphere upon tailors. Of 334 men, employed by Stultz & Co., in London, six are above sixty years of age; fourteen about fifty; and the greater number of the remainder about forty. Three of the six above sixty have curvature of the spine. Their most common affections are dyspepsia, diarrhœa, headach, giddiness, and anal fistula, to which latter they are so subject that they have a "fistula club." They attribute their complaints to the bent posture of their bodies for thirteen hours a day, and the heat of the workshop. Tailors are the most intemperate set of workmen in London. A large proportion of them die annually of phthisis. (Thackrah, &c. p. 17.) The diseases most commonly observed amongst shoemakers are chronic inflammations of the stomach, liver, and bowels, occasioned by the pressure of the last on the lower part of the sternum, where it occasions, in those who are long-lived, a considerable depression.

12. The sitting posture, when long or habitually continued, is very hurtful in persons of sedentary habits. M. Patissier remarks, that it causes the lymphatic to predominate over the nervous, sanguiferous, and muscular diathesis. Artisans and others who adopt it early in life, rarely acquire vigorous constitutions, or reach old age, although old age soon overtakes them. Persons with this habit soon become subject to dyspeptic disorders, to affections of the kidneys and urinary organs, to constipation, hæmorrhoids, various cachectic affections, obesity, and, in females, to fluor albus, and difficult or irregular menstruation. When, in addition to a long-continued sitting posture, the trunk is bent, and pressure frequently made over the epigastrium and sternum, as with shoemakers, weavers, at-

torneys' or bankers' clerks, &c., gastrodynia, nervous palpitations, chronic gastritis, pulmonary consumption, chronic pericarditis, and imperfect digestion, excretion, and assimilation, amounting even to complete asthenia, are the not infrequent results. The hurtful effects of the sitting posture and bent state of the trunk are much increased by deficiency of food on the one hand, or by too full living on the other; and by habitual excesses of any kind, but particularly in the use of ardent spirits.

13. Literary men who are of sedentary habits are liable both to the disorders which result therefrom, and to those which depend upon over-exertion of the mental faculties. Amongst the latter, melancholy, hypochondriasis, cephalalgia, paralysis, apoplexy, palsy, inflammation of the brain or of its membranes, mania, and softening of the brain, hold a prominent place. All these evils are, however, in a great measure prevented by moderate diet and regimen, by avoiding excesses of every description, by regular and moderate exercise in the open air, by early rising, by sufficient but not too much sleep, with attention to the digestive organs, and to the promotion of the abdominal secretions and excretions.

14. II. Class Second. 1st, *The undue exertion of particular organs, with or without insufficient exercise of other parts,* is often productive of most injurious effects; but much of the evils imputed to this cause by MM. Gosse, Merat, and Patissier, are either imaginary, or merely matter of occasional coincidence. *A.* The consequences of undue *muscular exertion* are chiefly hernia, aneurisms of the large vessels, dilatation of the cavities of the heart, hæmorrhages from the lungs or nose, injuries of the ligaments and intervertebral spaces, sprains and lacerations of muscles; and are chiefly met with among those occupations that are of a laborious kind, as porters, coal-heavers, draymen, &c. Of all these injurious consequences, hernia are very much the most frequent. Amongst all those persons who bring the back and superior extremities into frequent energetic exercise, it will be observed that the muscles of these parts are not infrequently developed either at the expense of those of the lower extremities, or to a degree far beyond them. This partly arises from the shuffling gait of those persons, and from not throwing the gastrocnemii muscles into action.

15. *B.* Over-exertion of the *vocal organs* is not infrequently productive of disease. The affections which proceed from this cause are hæmoptysis, laryngeal phthisis, aphonia, œdema of the glottis; functional, and subsequently organic, diseases of the heart and large vessels; nervous and cerebral affections. The persons most liable to be affected by this cause are public singers and orators; but I believe that the ill effects resulting from it, in any of the above states of disease, are not so great nor so frequent as some writers have stated. Much of the mischief imputed to this cause is referrible rather to the enthusiasm of singers and orators, to the passions which are called up during the exercise of their powers, and to the various dissipations and exposures into which their vocations lead them. The occurrence of musico-mania from excessive musical enthusiasm is known to all physicians. It is obvious that the first signs of the accession of the above diseases in the persons of singers and orators, require strict avoidance of the cause.

16. *C.* The continued or intense *action of light* on the eyes, and *application of them* to small objects, as amongst workers at iron forges and furnaces, engravers, watchmakers, embroiderers, painters, &c., are often followed by injury to, or entire loss of sight; persons thus employed being liable to amaurosis, cataract, inflammation of the retina, iris, or capsule of the lens, and to short-sightedness, owing to the more convex form the eye acquires from continued compression, by the muscles attached to the eye-balls.

17. 2d, *Unnatural or constrained positions* are extremely injurious in the prosecution of any art or employment. Occupations that require *long-continued standing* have been said to be productive of varices in the lower extremities; but I am not aware that such affections are more common amongst printers, who usually stand at the frames, than in other persons. There is no doubt of *undue pressure* made upon any particular part of the body in the exercise of any art or trade, or even slight pressure when long continued, being most injurious. This is remarkably the case when the pressure is made upon the abdomen, particularly over the epigastrium, and still more so if it impede the actions of the respiratory muscles. Various occupations, which are injurious from this cause, might be pursued with great assiduity by attending to those circumstances, many of them trivial, which may remove or counteract it. Thus clerks, and others, who are often injured by stooping over a desk, and by pressing the chest against it, as well as by the sitting posture too long continued, would be much benefited by frequently, or even occasionally, standing at a raised desk. Tailors and shoemakers are also very liable to suffer from this cause. The stooping posture is not infrequently productive of cerebral and nervous affections; hence the frequency of them in gardeners. Working in constrained positions shows its effects most decidedly in *miners* and *colliers*, who labour chiefly in the sitting or kneeling posture, frequently with the body bent in the greatest degree, in an unnatural atmosphere, often containing hydrogen, or carburetted hydrogen, and carbonic acid gases, and with artificial light. They are, moreover, exposed to changes of air, and occasionally work with their feet in water. They are generally spare men, with slightly curved spine, and bowed legs. When the dirt with which their skin is usually loaded is removed, the complexion seems sallow and unhealthy. Their complaints are asthma, rheumatism, disorders of the head, intolerance of light, &c., evidently resulting from the circumstances just stated, connected with their employment, and their exclusion from the beneficial influence of sunshine, light, and air. They are not generally very intemperate, yet they seldom live beyond fifty.

18. 3d, *Temperature and moisture,* and particularly rapid vicissitudes of them, are extremely productive of disease amongst artisans, but chiefly from negligence, and the want of caution in exposures to them. Forgers, glass-blowers, brass and iron founders, bakers, brewers, and various other classes of artisans, are liable to be affected by the *high temperature* in which they work, and by imprudent exposure to cold, when perspiring,

and often without any additional clothing. The most frequent consequences are checked perspirations, producing catarrhs, rheumatism, bronchitis, asthma, and inflammation of the lungs, or of some one of the abdominal viscera.

19. *a.* The bad effects of *moisture* only are problematical, or at least not very remarkable. It is only from the circumstance of its being either the cause of a greatly depressed temperature, or the very common vehicle in which other agents of disease are dissolved, and thereby diffused in the air, or applied in a more active state to the different organs, particularly the respiratory, that it becomes a very active agent of disease, as is demonstrated by the etiology of the intertropical and malignant diseases. When exposure of the external surface of the body to moisture is injurious, the mischief is caused chiefly by the depressing effects of the low temperature which it occasions. The animal heat is less rapidly carried off by entire submersion in water, than by aspersion merely. In the former case there is no evaporation, in the latter more or less evaporation takes place, and much cold is thereby generated. The histories of shipwrecks abound in proofs of this position. Dr. Currie, in his well known work, has adduced a striking example of it. It is owing to the evaporation which takes place from damp or moist clothes, and the consequent rapid reduction of their temperature, that disease isoccasioned by them.

20. Artisans who, from the laborious nature of their occupations, perspire copiously, and thereby render their clothes damp, seldom suffer from this cause while they continue their labours; but when they relax, or desist altogether, their wearing the moistened clothes, particularly in a state of exhaustion, is frequently productive of disease. Inattention to, or inability of, changing damp or wet clothes, are the most common causes of the disorders met with in milkmen, gardeners, fishermen, washerwomen, fullers, water carriers, and persons whose occupations are chiefly out of doors. In marshy or unhealthy localities the effects of this cause are greatly increased. The steepers and cleaners of hemp and flax are extremely liable to intermittents, owing to the conjunction of vegetable effluvia with moisture. Even persons constantly employed in crowded factories, where the stagnant air becomes loaded with the foul vapours exhaled from the lungs of a number of persons, may have their clothes so saturated with moisture as thereby to occasion the usual consequences of cold, when exposed to a drier or opener air. It should be kept in recollection, that cold, when it continues to act for any time upon the frame, is sedative — it depresses the vital influence; and, when acting partially, or directed to parts of the body only, that it is one of the most productive causes of altered energy and sensibility of the nervous system of such part, of irregular distributions of vital influence and of the blood, and consequently fruitful of inflammations, and of morbid discharges and actions.

21. *b.* The *prevention* of diseases resulting from the description of causes adduced under this head is important. Wearing flannel next the skin is amongst the most efficacious. For those who are exposed to moisture from out-of-door vocations, the use of external garments of dressed skins, or of tanned leather, or of oil-skin, during the time of exposure, is extremely serviceable, and is generally adopted by the fishermen of northern countries.

22. III. Class Third. 1st, The *mineral molecules*, which, either in the form of vapour or of minute disintegration, come in contact directly or immediately with various parts of the body, are extremely frequent causes of disease in artisans, and some of the maladies they produce are possessed of specific characters.

23. *A. Mercury* is one of the most common causes of the diseases of artificers, particularly workmen in quicksilver mines, glass-platers, gilders of buttons, toys, &c. Dr. Gosse has remarked the greatly increased sensibility of those persons to cold, even to the slightest diminution of temperature, evidently owing to depression of the vital energy and organic actions, and consequently of the process of animal calorification. Persons long or habitually exposed to fumes of quicksilver are generally affected with ulcerations of the mouth and fauces; painful or rheumatic affections of the periosteum, joints, limbs, and ligaments, particularly after exposure to cold; eruptions on the surface of the body, and all the affections, to which the term pseudo-syphilis has been applied; as well as many of those which are usually denominated cachectic. The effects are altogether the same, although slower in their accession and progress, as those which result from a too long continued, but not violent mercurial course.

24. *a.* Amongst the most important of the affections produced by the fumes or oxides of mercury in artisans is the *mercurial palsy*, the *tremblement mercurial* of the French pathologists. It is almost, but certainly not altogether, peculiar to these persons. Its approach is generally gradual, but occasionally sudden; it usually commences with slight convulsive snatches, followed by agitations and tremors of the affected muscles, particularly those of the arms, which it first attacks, occurring as it commonly does amongst the workers in mercury. If the person continues his employment, the affection extends to the lower extremities and whole body. He becomes incapable of muscular exertion, and even of the avocations requiring the least precision of muscular action. Restlessness, falling out of the teeth, constipation or disorder of the bowels, a dry and brownish state of the skin, slight atonic convulsions, cephalalgia, delirium, great depression of the nervous powers, and of the general health, take place, in which state the patient may continue to live for many years. (Merat and Colson.) Although it is chiefly long-continued exposures to mercurial preparations which produce this affection, a single exposure to their fumes, even for a few *hours*, when they float in the air, may occasion it; the effects being both rapid and violent when their vapours are inhaled with the atmosphere, and act upon the extensive surface of the bronchial tubes and air-cells.

25. *b.* The habits of the workmen exposed to the fumes or oxides of mercury, render the *treatment* of this affection extremely difficult, owing chiefly to the circumstances of their frequent recourse to spirituous liquors, for the temporary advantage they afford, and to their deferring having recourse to medical aid until the disease becomes confirmed. In recent cases, leaving off the trade

that occasioned it will alone produce a cure. In long-continued or confirmed cases, benefit is obtained with much more difficulty; and, when procured, the disorder is extremely apt to return after the slightest exposure to mercurial fumes. DE HAEN prescribed electricity in the cases which occurred to him. LETTSOM recommended sulphur; and I believe that its good effects are very considerable. In a case which lately came before me, of violent cephalalgia, with muscular tremors, &c., after a severe mercurial course, large doses of sulphur merely, given every night in treacle, produced a cure in a few days. Mr. PEARSON chiefly relied upon exposure to a dry and open air. SEMENTINI states, that he obtained uniform advantage from the internal use of the nitrate of silver, beginning with an eighth of a grain, and gradually increasing the dose to three grains in the day. I have lately employed the *tincture of iodine* in two cases of this affection with success; and in one case I lately prescribe *strychnine*, but lost sight of the patient before its effects were apparent.

26. *c.* It is obvious that it is of importance to be in the possession of plans to prevent the injurious effects of mercury on those employed in the arts in which it is used. These are sufficiently simple, and consist chiefly of common attention to cleanliness, and avoiding the fumes of the mineral during the various parts of the processes of gilding. Workmen should avoid touching the amalgams that are used with the naked hand; and ought to make frequent ablutions, particularly before taking a meal. During the process of volatilising the mercury by heat, the utmost caution should be exercised in performing the operation with a stove in which the current of air is very brisk, so that the fumes may be carried fully up the flue. In most of the manufactories in this country, the stoves are now sufficiently well constructed for this purpose, the carelessness of the artisan being the chief cause of danger from his occupation. M. JUSSIEU states, that the free workmen in the large quicksilver mines at Almaden, who took care to change their whole dress, and attended to cleanliness, were but little affected by their occupation; but that the slaves, who could not afford a change of raiment, took their meals in the mine generally without ablutions, were subject to swellings of the parotids, aphthous sore throat, salivation, eruptions, and tremors. (*Mém. de l'Acad. des Sciences*, 1719, p. 474.)

27. *B. Lead. a.* Injurious effects from lead, in the various states in which it is used, are very frequent and often fatal. Its oxides may be carried off in a state of vapour, dissolved in volatile substances, as by turpentine in painting, and thus be inhaled into the lungs, and act most injuriously on the frame. It may also pass into the alimentary canal in various ways, or it may be absorbed from the skin, particularly of the hands, where it will both act locally, and be carried into the system, and produce its effects as when introduced by the two former channels. These effects are chiefly lead colic and paralysis. The workmen employed in lead mines, those who are engaged in procuring it from its ores, who cast it or manufacture its various preparations, and who use them in the different arts, as plumbers, glaziers, painters in oils or water-colours, colour-grinders, type-founders, printers, are the most liable to be affected by lead; but all classes, under certain circumstances, may also experience injurious effects from it. The deleterious nature of this mineral is certainly very great; but the fatal results are surely not one in three annually, as stated by Sir JOHN SINCLAIR.

28. *b.* M. MERAT has furnished some very interesting information respecting the frequency of *colica pictonum* in the various classes of artisans who come in contact with any of the different preparations of lead. It is derived from the list, kept at the hospital La Charité, in Paris, in the years 1776 and 1811. The total number in both years were 279. Of these 241 were artisans, whose trades exposed them to the poison of lead, viz. 148 painters, 28 plumbers, 16 potters, 15 porcelain makers, 12 lapidaries, 9 colour grinders, 3 glass blowers, 2 glaziers, 2 toymen, 2 shoemakers, 1 printer, 1 lead miner, 1 shot manufacturer. Of the remainder, 17 belonged to trades exposed to copper. Of the 279 cases, 24 were under twenty years of age, these being chiefly painter boys, not above fifteen; 113 were between nineteen and thirty; 66 between twenty-nine and forty; 38 between thirty-nine and fifty; 28 between forty-nine and sixty; and 10 older than sixty. Among the 279 cases, 15 died, or 5·4 per cent. (See the article COLIC, FROM LEAD.)

29. *c.* The *measures of prevention* from the action of the preparations of lead differ in no respect from those which have been stated in relation to mercury (§ 26.). They chiefly consist of strict attention to personal cleanliness. The instructions given by M. MERAT are very complete, but are too particular to be followed by workmen. He recommends that the working clothes should be made of strong compact linen, be changed and washed once or twice a week, and be worn as little as possible out of the workshop; a light impervious cap ought always to be worn on the head. The artisan should never take his meals in the workshop, or without strict ablution of the hands, mouth, and face; and he ought to breakfast before leaving his home.

30. Derangements of the digestive organs ought to be watched with care. If colicky symptoms occur, he should leave off work, and take an aperient. He ought always to guard against constipation. The *diet* of those exposed to be affected by the preparations of lead is of consequence. It should be light and digestible; and poor acid drinks ought to be avoided, particularly cider, as themselves often containing lead. Various articles of diet have been recommended as calculated to impede the hurtful action of lead on the frame. HOFFMANN mentions brandy — a somewhat dangerous recommendation. Fat food has been accounted preservative. DE HAEN states, that the workers in a lead mine in Styria were much affected by colic and palsy, but, by being told by a quack doctor to eat a good deal of fat, particularly at breakfast, they were exempt from these diseases for three years (*Rat. Med.* p. i. ch. ix.). Similar facts respecting the good effects of fat meat, as a preventive of the effects of lead, are recorded by Sir GEORGE BAKER (*Trans. of Lond. Coll. of Phys.* vol. ii. p. 457.), and Mr. WILSON (*Edin. Phys. and Lit. Essays,* I. p. 521.). Those who work at furnaces in which lead is smelted, fused, or oxydised, should be protected by a strong draught through them. Mr.

Braid, of the extensive mines at Leadhills, informed Professor Christison (*see his most valuable work on Poisons*, &c. p. 506.), that wherever furnaces of such a construction have been built, the colic has disappeared.

31. *C. Copper*, although extensively used in the arts, is seldom productive of much disease. Patissier states, that the workmen in copper become prematurely old, having a meagre and sickly appearance. This is, however, as much owing to confinement in ill-ventilated places, and intemperance, as to the metal. Merat has adduced evidence of their being frequently subject to colica pictonum. They are likewise liable to diseases of the respiratory organs,—particularly those engaged in filing the metal; but this is entirely owing to the mechanical irritation occasioned by the finer particles when inhaled into the lungs. Asthma is frequent amongst brass-founders, owing probably to this cause, and partly to the vaporisation of a portion of the zinc with which copper is amalgamated.

32. *D. Zinc, arsenic, and antimony* are seldom productive of hurtful effects amongst artisans; owing probably to the first being chiefly employed in the metallic state, in which it has no effect, although it is deleterious when oxydised; and to the circumstance of arsenic and antimony being generally used in small quantities.

33. *E.* The *acrid vapours*, which proceed from the *mineral acids* often produce violent effects when respired; chiefly asphyxia, and severe inflammation of the air-passages; but they are easily guarded against, and chiefly by operating in nearly open places. Persons who prepare articles for gilding, by cleaning them in aqua-fortis, are equally liable to respire the vapours of these acids, but may avoid them with even a moderate share of caution. The inflammations of the respiratory organs occasioned by them, differ merely in respect of their intensity, from the same diseases proceeding in an acute form from other causes. Chlorine gas, when respired in considerable quantity, produces inflammation of the air-passages. The chief effects of habitual exposure to it are acidities and other complaints of the stomach. The trades in which workmen are exposed to chlorine do not seem to be unwholesome. Corpulent men are soon reduced by it to their natural size. During the epidemic fever that raged all over Ireland from 1816 to 1819, the people at the chemical manufactory at Belfast were entirely exempt from it.

34. 2d, *Molecules of animal matter in a state of decay* are frequently productive of disease, both in persons whose avocations expose them frequently to this cause, and in those who approach it only incidentally. Nightmen are chiefly exposed to this source of disease, particularly in Paris. The gases evolved when emptying the *fosses d'aisances* of that capital are frequently productive of serious and even fatal consequences. The exact nature of these varies with the vapours evolved. Ammoniacal vapours usually occasion what the French term *la mitte:* sulphuretted hydrogen, hydro-sulphuretted ammoniacal gases, and azote, produce *le plomb.*

35. *A.* The *symptoms of la mitte* are smarting of the eyes, with the sensation of sharp or pungent odour and uncomfortable feeling about the nose. To these succeed pain, extending to the forehead, and discharge from the eyes, occasionally with blindness enduring for two or three days. These effects, if not very intense, generally pass off by shading the eyes, and exposure to the open air: if they are more severe, the application of cold epithems to the eyes, and protecting them from the light, are usually efficacious.

36. *B. Le plomb* is of two kinds: 1st, that occasioned by azote, and which is simply Asphyxy (which see) from the privation of respirable air, attended with coma or stupor; 2d, that caused by sulphuretted hydrogen and hydro-sulphuretted ammoniacal gases, which is the most dangerous and common, and is generally attended with convulsions. (See Poisons.) The former is commonly prevented by a free circulation of air; the latter is avoided by employing the chlorurets of lime or of soda, a solution of which is poured in the privies, and reservoirs or drains, shortly before they are emptied. (See *Treatment of* Asphyxy and of Poisoning *by deleterious Gases.*)

37. *C.* The animal effluvia proceeding from slaughter-houses, dissecting-rooms, chandlery or adipocire manufactories, and other places where in the substances are manufactured or employed animal arts, are seldom so concentrated as to be productive of disease; but there can be no rational doubt of their unwholesome influence when concentrated, or accumulated in a stagnant atmosphere. The liability of butchers and cooks to be corpulent has been absurdly enough ascribed by some superficial writers to the absorption of nutritive particles from the air, without attending to the fact of a much larger quantity of animal food being taken by them than by any other class of persons.

38. Dr. Withering had noticed (Letter to Dr. Beddoes, 1793.) the comparative exemption of butchers and catgut-makers from phthisis. M. Patissier has made the same remark; and Dr. Beddoes has added to these employments soap-boilers, and the fishermen and fish-wives in the vicinity of Edinburgh. Glue and size boilers are exposed to putrid and ammoniacal exhalations from the decomposition of animal refuse. But these workmen are generally fresh-looking and robust. A similar observation is applicable to *buckram manufacturers. Tanners* are subject to animal vapours; but so combined with the odours of lime and tan as entirely to counteract any injurious effect which the former might produce. They are much exposed to wet and cold; yet they are generally healthy, robust, and tolerably exempt from pectoral diseases, particularly consumption. Mr. Thackrah states, that he has carefully enquired at several tan-yards, and could not hear of a single example of this disease.

39. 3d, *Vegetable molecules.* Corn-millers suffer remarkably from breathing an air loaded with the particles of flour. They are chiefly affected by indigestion, asthma, and morning coughs with expectoration, terminating either in consumption or in asthma; and are generally pale, sickly, and short-lived. This is the case only with those who work in the mills. Those amongst them who labour in the open air with the carts are not thus affected; but, as other persons raising heavy weights, are subject to herniæ. *Maltsters* are liable to the same diseases, arising from the same agents, and from the heated and sulphureous air of the kilns. *Bakers* are exposed to similar causes,

but to a much less extent, and suffer accordingly — chiefly from cough, asthma, affections of the stomach, rheumatism, and a peculiar chronic eruption on the skin. *Snuff-makers* are exposed to the dust of the tobacco; but they are not so much affected by it as may be expected. They chiefly complain of disorders of the head, stomach, and air-tubes: of the former, from the narcotic effect of this vegetable; and of the last, from its irritation. The narcotic odour to which *tobacco manufacturers* are liable is not productive of any very appreciable mischief, owing to their having become insensible to its influence.

40. 4th, I shall here briefly notice those trades, the workmen in which experience the very injurious effects of inhaling an atmosphere in which various *vegetable, animal, or mineral molecules are floating*, — causes which, although very dissimilar in themselves, generally act in nearly a similar manner — namely, by irritating the bronchial surface, and superinducing various modifications of disease, according to peculiarities of constitution, temperament, and habits of life. *a*. The artisans who suffer the most from these causes are dry grinders and needle-pointers; edge-tool, gun-barrel, and other grinders; flax-dressers, and pearl and horn button makers; iron, brass, and other metal filers; stone-cutters, miners, and quarriers, particularly in sandstone; wool-carders and feather-dressers; sawyers, turners, weavers, and starch-makers. All these suffer more or less, generally in the order here followed (needle-pointers and dry-grinders the most, and starch-makers the least), from chronic bronchitis, in one or other of its modifications: in some, from the spasm of the bronchi thereby occasioned, with the symptoms of asthma predominating; in others, with those of chronic inflammation extending to the lungs; in a few, with pulmonary emphysema; and in many, with tubercular and cretaceous formations. The most inflammatory effects seem to result from needle-pointing, dry-grinding, and stone-cutting; whilst the more asthmatic affections proceed from the horn and pearl button manufacturing. These workmen seldom live above forty years, and the greater number not beyond thirty or thirty-five. They often experience but little inconvenience till some time before the fatal disease takes place; but they are as often affected in early life, particularly pearl and horn button makers, the disease subsequently assuming an asthmatic character.

41. *b*. Various means have been invented in order to prevent the molecules or dust arising in these trades from accumulating and being inhaled into the lungs of the workmen; but nearly every measure hitherto advised has been neglected by them. Amongst other contrivances, the muzzle of damp crape recommended by Dr. Johnstone, the sponge by Dr. Gosse, and M. D'Arcet's "fourneau d'appel," which is, however, not known in this country, may be named. The best means yet devised seems to be that invented by Mr. Abrahams of Sheffield, in which magnetic attraction is employed to arrest the floating metallic particles. This, as well as the use of the "damp bag" suspended over the stone, in grinding and pearl button turning, are most useful inventions. In mining, quarrying, or cutting stones, dry-grinding, &c., much good would probably result from having moistened or wet woollen curtains suspended over the heads of the workmen, and in such a way as to be agitated through the air of the place. The simpler the means, and the less trouble required in their use, the more likely are they to be adopted.

42. *c*. In respect of the treatment of the pulmonary diseases which result from these causes, very little difference from that employed under ordinary circumstances is required. The frequent use of emetics is adopted by the workmen themselves; and there can be no doubt of their utility in the most of the diseases of the air-passages. The other means of cure are fully noticed in their respective places.

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ASCARIS. See Worms.

ASCITES. See Dropsy of the Peritoneal Cavity.

ASPHYXY. (From the privative *α*, and *σφύζω*, I beat, I leap.) Syn. Ασφυξια, Hip. *Asphyxia*, Auct. Lat. *Apoplexia Suffocata*, Cullen. *Asthenia Suffocatio*, Young. *Asphyxie*, *Le Pouls manquant*, Fr. *Der Scheintod*, *Pulsstillstand*, *Eine tödtliche Ohnmacht*, Ger. *Mancumento di polso*, Ital.

Classif. 2. *Class*, Nervous Diseases; 1. *Order*, Comatose Affections (*Cullen*). 4. *Class*, Diseases of the Nervous Function; 4. *Order*, Affecting the Sensorial Powers (*Good*). I. Class, III. Order (*Author*, see *Preface*).

1. Defin. *Suspended animation proceeding from a primary arrest of the respiratory actions, the other functions being thereby abolished.*

2. Asphyxy, according to its etymology, should be defined, the cessation of the action of the heart. In this case it would be synonymous with certain forms of syncope, from which, however, it most essentially differs. Yet even in syncope the most complete, the action of the heart never altogether ceases; it is only unusually weakened, and previously to respiration being affected. Attention to the phenomena to which the term asphyxia has been so long applied, will inform us that the actions of respiration are primarily arrested; that the functions of circulation are subsequently abolished; and that death is the result of this succession of events. It may, however, be stated, in justification of the change of signification which this term has undergone, that there is no state of the system from which recovery is possible, that is characterised by a more complete abolition of the action of the heart than this, although it takes place secondarily only from the arrest of the respiratory functions.

3. Asphyxy has been very generally viewed as proceeding from causes which act in various ways; and the opinions respecting their nature and mode of operation have been extremely deficient in precision and accuracy. According to the meaning which I have attached to the term, as stated above, asphyxy can only occur in a direct or primary form, from causes which either exclude

the air from the lungs, prevent its renewal, or abstract that constituent of it which is requisite to the respiratory functions. Authors have, however, included, under the head of asphyxies, those states of suspended animation which proceed from the respiration of deleterious gases: and Dr. GOOD has comprised under it death or suspended animation from lightning and from intense cold. In every case of the action of deleterious gases, of lightning, and of intense cold upon the system, the respiratory organs, although one of the channels for the action of the latter, are not the first to have their functions arrested. The action of all these agents is primarily exerted upon the ganglial and nervous systems; and, owing to their effects upon these systems, the function of the brain, of respiration, circulation, &c. are subsequently abolished. As the action of the greater number of deleterious gases, when respired, is similar to that of other irritating and narcotic poisons, I shall consider them under the head of gaseous poisons (see POISONS). When, however, they are of such a kind, or are present to such an extent, as to irritate violently the larynx, and, by exciting spasm of it, to exclude the air, or so as to displace, and to occupy the room of, the respirable atmosphere, their action is similar to other agents primarily occasioning simple asphyxy: and they therefore require no further notice than by adducing them as causes of this state. In respect of the influence of cold and lightning upon the frame, it may be observed that, although exciting and concurrent causes of asphyxy, and producing this, with other changes in the vital functions, but in very different ways, they act directly upon the nervous system, and give rise to asphyxy only secondarily; and, like the more poisonous gases, chiefly through the medium of this system, particularly that part of it which presides over the functions of the brain and heart. Their action will therefore fall under different heads.

4. I. CAUSES. — Asphyxy takes place in a primary and simple form, from whatever excludes, or prevents the renewal of, air in the lungs of a healthy person, or consecutively upon other affections or diseases, especially those affecting the nervous system, and particularly the respiratory class of nerves. In the former state of the frame it is an *idiopathic* or *essential* affection; in which light it will be chiefly viewed in this place: in the latter it is *symptomatic*, or rather one of the modes in which disease terminates life. These states of asphyxy may proceed, *first*, from a primary cessation of the mechanical phenomena of respiration, and, *secondly*, from a primary default of the chemical changes which take place during the respiratory actions.

5. To the FIRST of these is to be referred the asphyxy which depends upon inaction of the respiratory muscles (*A.*); and (*B.*) upon deficient expansion of the lungs, the inspiratory muscles performing their functions. *A.* Deficient or impossible action of the inspiratory muscles proceeds, 1st, from mechanical obstacles applied to them, as in the instances of death occasioned by earth falling upon the trunk of the body, and pressing it so strongly as to prevent them from expanding the thorax: 2d, from deficient or interrupted influence of the nerves supplying these muscles, as from injuries or division of the pneumogastric nerve; injury or pressure upon the medulla oblongata or spinal chord, either from fracture or dislocation of the spine, particularly of its cervical portion; and from the paralysis of the nervous system occasioned by a stroke of lightning, or any other cause abolishing its energy: and, 3d, from want of activity, or deficient irritability of the inspiratory muscles themselves, as from the benumbing influence of cold, and the suspended animation of new-born infants.

6. *B.* The asphyxy which proceeds from a deficient expansion of the lungs, is generally owing, 1st, to mechanical impediments, as the passage of some of the abdominal viscera through the diaphragm, the accumulation of fluids in the pleura, or similar causes: and, 2d, from paralysis of the nervous energy of the lungs, as in cases of death from cold, from lightning, from various poisonous gases, &c.; whereby the vital expansibility of the organ is abolished, along with the other respiratory actions.

7. The SECOND class of causes, or those which act by impeding or abolishing the chemical changes effected by respiration, may be referred to two heads: — 1st, Those which present a mechanical obstacle to the entrance of air into the lungs, as strangulation; submersion; the introduction of foreign bodies into the larynx, trachea, or even the large bronchi: and, 2d, Those which consist of a deficiency of respirable air, as a too rarified atmosphere, or the presence of azote, hydrogen, carburetted hydrogen, protoxide of hydrogen, or indeed of any of the deleterious gases. It is evident, however, that asphyxy is often occasioned by the combined operation of more than one of its proximate causes. Thus it may proceed from paralysis of the respiratory muscles, and of the nervous energy of the lungs themselves; and hence be characterised by abolition of the respiratory efforts, by deficiency of the expansive power of the organ, and by arrest of the chemical changes which take place during respiration: and, on the other hand, several of the remote causes act by individually producing more than one of the pathological conditions now specified.

8. II. *Characteristic phenomena of Asphyxy.* — When asphyxy takes place slowly, especially from causes which interrupt the nervous influence actuating the respiratory muscles, it commences with greater or less difficulty of elevating the thorax; anxiety, with urgent desire to inspire, and constant attempts to fill the lungs, giving rise to continued gaspings, or quick, short, and imperfect respiratory efforts; pandiculation; vertigo; failing of consciousness and sensation; sometimes to convulsive movements both of the limbs and trunk, followed by immobility of the parietes of the thorax and abdominal muscles, weak and languid pulsation of the heart, and absence of pulse at the wrist; the face is coloured, livid, tumid, injected, and its veins distended; the hands and feet, as well as the face, present a reddish violet hue; and the cutaneous surface patches of a similar tint. At last the circulation is entirely arrested, and asphyxy is complete. The animal temperature, however, and the absence of rigidity of the muscles, continue for a long time afterwards, — almost always for a much longer period than from death under other circumstances, and from other proximate causes.

9. These *phenomena* vary, particularly as respects the rapidity of their progress, according to the causes whence they proceed, and to the extent to which air is excluded from the lungs. Where no obstacle to the action of the inspiratory muscles is present,—the obstruction to respiration existing in the air passages,—the efforts to renew the air in the lungs are much more convulsive and laborious. The anxiety is extreme, but of short duration, and rapidly followed by abolition of consciousness, voluntary motion, and of the functions of circulation. In this case the description of Shakspeare is physiologically accurate:—

> " But, see! his face is black and full of blood;
> His eyeballs further out than when he lived,
> Staring full ghastly, like a strangled man;
> His hair upreared; his nostrils stretch'd with struggling;
> His hands abroad display'd, as one that grasp'd
> And tugg'd for life, and was by strength subdued."

10. In cases where asphyxy arises from a sudden *abolition of the nervous influence* of the respiratory muscles, as from injuries inflicted on the medulla oblongata, &c., or when the trunk of the body is so compressed as to prevent all action of these muscles, but particularly when it proceeds from the former cause, the phenomena supervene and succeed each other with great rapidity; but generally in the order in which I have enumerated them, excepting that all respiratory efforts are instantly suppressed. In drowning, however, the progress of the symptoms are less rapid and somewhat different, as will be shown in the sequel.

11. III. The *duration of life* in cases of asphyxy is very different, according as the causes which occasion it act with greater or less promptness, or more or less perfectly, in preventing the renewal of air in the lungs. In general, the more slowly that abolition of the respiratory function takes place, as in cases of drowning, the longer does the action of the heart continue, although feebly and slowly, even after respiration has ceased; and to this circumstance, as well as to the fluidity of the blood, which is long preserved, is owing the power we possess of recalling the asphyxied to life; the more slowly the state of asphyxy supervenes, the longer the person retains the ability of being reanimated, and *vice versâ*.

12. The length of time, however, after which resuscitation cannot be accomplished is necessarily varied by different circumstances; and not only by the causes of asphyxy, and their modes of operation, but also the strength of constitution, age, and previous health of the person, and the manner in which abstraction of air has taken place. Much will also depend upon the changes which the asphyxy has produced in the brain,—the degree of congestion, or the occurrence of extravasation there,—circumstances which, when present to any very considerable extent, more particularly the latter, will generally preclude the possibility of reanimation.

13. IV. *Appearances observed on dissection of asphyxied persons.*—A reddish or violet red hue of the countenance and various parts of the surface of the body, which continues to retain its warmth an unusual length of time after death: this tint does not arise from the position of the body after death; and is chiefly seated in the mucous or vascular tissue of the skin, which, upon incision, allows the blood to escape in a state of fluidity. The eyes are bright and prominent; the mouth sometimes natural, at other times expressive of suffering; the limbs are rigid, and continue in this state unusually long, after having been late in assuming it. The veins and sinuses of the brain generally are filled with a dark fluid or semi-fluid blood; the substance and cavities of the brain are not otherwise materially altered. The base of the tongue is generally full or injected, and even tumified, and its papillæ developed; the mucous membrane of the larynx, trachea, and bronchi, is injected and red — the colour becoming darker as we descend from the larynx to the bronchial ramifications, where it assumes a violet or reddish brown tint. Their smaller branches often contain a little sanguineous frothy mucus. The lungs are distended, rise around the pericardium, and present a brown or blackish brown hue; their parenchyma, when divided, are of a redder tint, but give out, upon pressure, large drops of a thick, fluid, and very black blood. The liver, spleen, and kidneys are gorged with blood, presenting a similar appearance. The veins of the heart are congested; and its right cavities, the vena cava, and other large veins, are engorged with black and semi-coagulated or fluid blood.

14. V. *Theory of Asphyxy.*—It is chiefly to Goodwin and Bichat that we are indebted for the near approaches which have recently been made to a satisfactory and consistent theory of asphyxy, upon which a rational mode of treatment may be based. The venous blood sent by the right ventricle to the lungs, which contain a diminished quantity of air calculated to convert it into arterial blood, is returned to the left side of the heart, but slightly changed from its venous state, from whence it is propelled through the arteries to the different organs. The consequence of the imperfect changes effected in the blood, owing to the interruption or cessation of the respiratory actions, is imperfect excitation of the most important organs of the body; and in proportion as the blood sent from the left side of the heart is possessed of more of the venous characters, the absence of excitation is more manifest, until, as respects the brain, and lungs particularly, which are the first of all the organs to experience the effects resulting from the circulation of venous blood, a sedative or stupifying effect, but negative in respect of its nature, is produced upon them; as is frequently evinced on the brain in cases where asphyxy takes place slowly, and when the blood sent from the left side of the heart is completely venous in its characters.

15. In tracing the phenomena it will be observed, that the capillary system of the lungs is the first to experience a loss of their vital tone and undergo congestion. This arises from the following causes:—1st, The absence of the usual stimulus of pure air in the air-cells: 2d, The circumstance of their being the first to receive the blood after being returned from other parts of the body fully charged with venous properties: 3d, The cessation of the mechanical actions of respiration; and, with them, of the expansive motions of the lungs themselves: 4th, The arrest of those changes which the blood undergoes from oxygenated air, and the influence of a darker blood than usual upon the pulmonary vessels: 5th, The loss of nervous influence, arising from the sedative effect of venous blood upon the

nervous centres, when circulating in arterial vessels: and, 6th, The circumstance of the systemic capillary vessels retaining their tonicity and power of reacting, for a longer time, upon their contents, when circulating venous blood, than the pulmonary capillaries; consequently the blood is returned by them into the veins, and thence to the right side of the heart to be sent to the lungs, which are the first, from this and the foregoing causes, to experience congestion, and to lose the power of restoring it to the left auricle. Thus it will be seen, that the interruption to the circulation commences in the capillary system of the lungs, in consequence of the stop put to the mechanical and vital actions of this organ; and that the heart, which does not cease to contract until the functions of the lungs and brain have been abolished, no longer is supplied with blood from the lungs; the left side of the heart being thus the *ultimum moriens*.

16. The early and manifest effects of asphyxy on the brain have been fully proved by the experiments of Bichat. This organ is deprived of its functions, and the comatose state is rapidly and profoundly expressed; the venous blood conveyed to it, chiefly from its negative effects, giving rise to all the phenomena usually occasioned by a narcotic poison. Even the heart itself, although the last of the three organs to experience the effect produced by the circulation of venous blood, is soon enfeebled in its action. This evidently arises partly from the abolition of the functions of the brain, and partly, or even in a greater degree, from the circulation of dark blood to the ganglia and nerves, whence the heart derives its action, and to its proper structure. But the experiments of Dr. Edwards and Dr. Kay evidently show that the circulation of dark blood does not destroy the irritability of muscles, but that it is a less powerful supporter of this property; and consequently that the irritability of the heart is not abolished, as Bichat supposed, but only insufficiently excited. Indeed, if this property were destroyed, resuscitation would be impossible.

17. The long continuance of the animal heat after the total cessation of the heart's action can only be explained by the integrity of the vital energies of the frame at the time of the event, by the continued fluidity of the blood, and the circulatory or oscillatory motion of this fluid in the systemic capillary system for a considerable time after the heart has ceased to contract, — phenomena, which have been satisfactorily observed in cases of asphyxy. The patches of lividity, and the dark colour of the surface, depend upon the injection of the capillaries of the surface with dark blood, and the engorgement of the veins. The slow accession of rigidity of the limbs after death is referrible to the longer duration of the animal temperature, and the fluidity of the blood, than in other cases; and to these causes also are to be imputed the possibility of resuscitation after a longer period from the cessation of respiration than in any other morbid condition of the frame. The marked rigidity of the limbs, after the body is quite cold, must be chiefly imputed to the perfect state of the vital energies when asphyxia took place.

18. It has long been observed that the body of an asphyxied person appears to contain much more blood than that of an individual who has died in a different way. Bichat explains this by supposing that the organs receiving venous blood, which is devoid of the materials necessary to nutrition, yield all the fluids which they usually furnish without appropriating those which they usually do under other circumstances; so that the quantity of blood is actually increased, particularly in cases where the asphyxy takes place slowly. In proof of the accuracy of this view, it has been stated that, when asphyxy occurs suddenly, and the functions cease rapidly, less engorgement of the venous system and of the lungs is observed, than when death is caused more slowly, as in the case of asphyxy from burning charcoal. Perhaps the quantity of blood in the system seems greater from the circumstance of its fluidity, or rather the absence of coagulation; for when this takes place, the serum of the blood partly escapes into the shut cavities after death, and exudes through the vessels and tissues.

19. From the foregoing, therefore, it may be concluded that the cessation of the actions of respiration, — first the mechanical or muscular actions, next the vital or expansive motions of the lungs, — is soon followed by an arrest of the pulmonary circulation, afterwards by abolition of the nervous functions and influence, and lastly by cessation of the heart's action, in consequence of the blood not being restored to the left auricle and ventricle; the latter of which, however, continues to contract as long as blood is sent to it. Hence, as respects the circulation, first, stagnation of the blood in the pulmonary capillaries upon the cessation of respiration takes place; next, a deficient supply of blood to the left side of the heart; and, lastly, an accumulation of it in the pulmonary arteries, and right auricle and ventricle, which are no longer able to overcome the resistance opposed to its passage in the congested pulmonary vessels. Thus it will be seen that the left ventricle is actually the *ultimum moriens*, and not the right, as supposed by many. Upon this view of the procession of phenomena in death from asphyxia, our endeavours to restore animation are founded.

20. V. The *varieties of Asphyxia*, in a practical as well as physiological point of view, deserve particular notice. The respiration of several gases is often followed by fatal consequences; but as asphyxy is only one of the deleterious effects they occasion, I have considered them in another place (see Poisons — *Gaseous*.). Of all gaseous bodies from which asphyxy may arise, azote and hydrogen alone act simply by producing asphyxy; and they have this effect only when they are present in considerable quantity in the air, or when they are respired for some time. The effects which they produce differ in no respect, in the present state of our knowledge, from those described above.

21. *A. Asphyxy from submersion.*—*a.* There are various circumstances, both proper to the individual, and connected with the submersion, which will modify the resulting asphyxy, and should be taken into account in our endeavours to restore animaion. When a person is immersed in water he is seized with an urgent feeling of anxiety at his breast; his pulse becomes weak and frequent. He struggles to relieve his distress, and thereby

rises to the surface of the water, and throws out some air from his lungs. His anxiety continues to increase, and his pulse becomes weaker; his struggles are renewed with more violence; he rises to the surface again, throws out more air from the lungs, and makes hurried attempts to inspire, and in some of these attempts a quantity of water goes down the throat with the air, and excites cough and spasm of the glottis. These efforts tend to determine blood to the head, which, owing to the impeded state of respiration, partakes of the venous properties; and rapidly induces, from this circumstance as well as from the pressure it occasions, insensibility, loss of voluntary motion, slight lividity of the surface of the body, particularly of the face, loss of pulse, relaxation of the sphincters, and as the body sinks to the bottom, the expulsion of a portion of the air contained in the chest.

22. *b.* On *dissection*, nearly the same appearances as those already described are found. In addition to these, a frothy fluid is met with in the trachea, and ramifications of the bronchi, with some water, the quantity of which varies in different cases. From Dr. Goodwyn's very satisfactory experiments, confirmed by Mr. Coleman and Professor Meyer, it appears that this small quantity of water enters during the struggles to inspire, and, mixing with the mucous of the bronchi, forms a frothy fluid, insufficient, however, to occasion the fatal changes in drowning. A considerable quantity of fluid is found in the stomach. According to Dr. Curry, the vessels of the brain are not particularly distended; but there are exceptions to this. Dr. Berger, of Geneva, found that the air remaining in the lungs had lost nearly all its oxygen. Mr. Coleman states that the left ventricle of the heart is never entirely empty, it generally containing about half the quantity of that found in the right ventricle; and that a little blood is also found in the aorta.

23. *c.* In cases where a person, in falling into the water, has been struck on the head and stunned, or is intoxicated, or benumbed with the cold and fright, the efforts at preservation will scarcely be made, and the case will be more completely that of simple asphyxia. In cases of this description the countenance is generally pale. The period after which reanimation may be procured is extremely various — generally from five minutes to three quarters of an hour. Of twenty-three persons recovered from drowning, one had been three-quarters of an hour under water; four, half an hour; three, a quarter of an hour; and the rest for shorter periods. Dr. Edwards has very satisfactorily demonstrated that life is more rapidly extinguished by submersion in water of a very low temperature than in that of higher grades, evidently owing to the sedative effects of cold upon the nervous system. When submersion takes place during intoxication, there is greater risk of congestion or extravasation in the brain being superinduced; and if syncope, by the fright attending submersion, occurs, fatal congestion and paralysis of the heart and lungs will chiefly supervene, but in a slower manner than under other circumstances; and, as M. Leroy (*Archiv. Gén. de Méd.* t. xvii. p. 469.) supposes, thus admitting of resuscitation at a longer period after submersion.

24. *B. Asphyxy from strangulation.* — When asphyxy is produced by hanging, and if the exclusion of air from the lungs is complete, the following appearances are generally observed: — After loss of sensibility, epileptic convulsions, sometimes slight, at other times marked; and generally attended with erections and emissions; turgidity, suffusion, and lividity of the face, extending to the shoulders, chest, arms, and hands: the eyes are open, projecting, and their vessels injected; the features are distorted, and the tongue thrust out of the mouth; the external muscles of respiration are firmly contracted; the hands are clenched, and the sphincters relaxed. When the air is not perfectly excluded in hanging, the sufferings are prolonged, the engorgement of the head and face is greater, the lungs are less loaded with blood, and the vessels of the brain more congested, than when the air is completely excluded. In the majority of cases of asphyxy from hanging, the lungs contain more air than after death from natural causes, or from suffocation by a pillow when the air is only imperfectly excluded from the lungs.

25. There can be no doubt, that although death is caused by asphyxy in cases of strangulation, as proved by De Haen, Monro, and others, the interruption which the cord occasions to the return of blood from the head, and the consequent congestion of the encephalon, accelerate death. In some instances, also, there is reason to believe that fracture, dislocation, or subluxation of the vertebræ of the neck is produced in the execution of criminals; but it very rarely, or perhaps never, occurs in cases of suicide by strangulation. To these additional effects upon the encephalon and medulla oblongata is to be partly imputed the want of success in our attempts to restore animation after strangulation.

26. VI. General Treatment of Asphyxia. — The indications which naturally suggest themselves from the consideration of the causes of asphyxia, their mode of operation, and the ultimate results which they produce, are, 1st, to remove the patient as soon as possible from the causes which occasioned the asphyxied state; and, 2d, to restore the function of respiration, and, through it, the circulation. The necessity of fulfilling the former of these is sufficiently obvious, and the means of doing so will necessarily vary with the nature of the cause, which should be instantly ascertained; but without delaying the employment of means to restore respiration.

27. The restoration of the function of respiration is to be attempted by various means, calculated, in the *first* place, to dislodge the impure air contained in the lungs; *secondly*, to replace it with pure air; *thirdly*, to excite the remaining vitality of the nerves and muscles; and, *fourthly*, to restore the circulation by measures calculated to return the blood from the lungs to the left side of the heart. The simultaneous attainment, as far as may be, of these objects, is to be attempted by a judicious combination of means. *a.* The patient should be placed on his back, in an *open air* of a mild or somewhat high temperature, of from 65 to 70 deg. of Fahr., with the chest, shoulders, and head slightly elevated. He should be stripped of his clothing, and enveloped in a warm blanket. None but the assistants ought to be admitted into the room. The body should be

placed at a convenient height for the employment of the measures of reanimation. *Pressure* should then be made upon the breast and abdomen, *alternating with relaxation,* in such a manner as to simulate the actions of the chest in respiration. By this means the foul air will be thrown out of the lungs; and the restoration of the capacity of the thorax, upon the removal of the momentary pressure, by the elasticity of the costal cartilages, will draw fresh air into the lungs. It will sometimes be of service to apply a hand upon each side of the thorax below the arm-pits, and by gentle shocks endeavour to expel the vitiated air. Whilst this is being performed, bottles of warm water should be placed to the feet, under the knee-joints, between the thighs, and under the arm-pits. Dry warmth is particularly beneficial when applied to the epigastric region. Warm stimulating frictions over the surface should also be employed.

28. *b.* After having used pressure so as to simulate respiration for a few moments, *insufflation* of the lungs is next to be resorted to. This may be performed by the mouth, or by a bellows. When the latter is not at hand, the former must be adopted. The operator having closed the nostrils, and applied his mouth to that of the patient, is to blow forcibly into it, pressing the chest afterwards, in order to expel the air, and again blowing forcibly into the chest. If the lungs cannot be inflated in this way, the operator should blow into one nostril, having closed the other and the mouth; and if a small wooden tube can be procured, this may be used for the purpose, by inserting one end of it into the nostril, and blowing into the other; or the pipe of a bellows may be inserted into it.

29. *c. Insufflation* of the lungs by the breath of the operator has been recommended by some in preference to the use of the bellows, on account of the higher temperature of the air thrown into the lungs by the former mode; whilst others prefer the latter method, on account of the purer air furnished by it. I believe that the advantage of the higher temperature of the former nearly counterbalances the disadvantage of less purity. If, therefore, insufflation by the bellows of a warm air could be had recourse to, considerable benefit might be obtained. If the bellows are used, the pipe is to be introduced into one nostril; and, whilst the mouth and other nostril are closed, and the *pomum adami* pressed gently backwards and downwards by an assistant, the bellows are to be opened and immediately closed, so as to throw air into the lungs by a single stroke; after which, allowing the mouth and nostril to open, the chest is to be pressed so as to expel the air: thus air is to be forced in, and again expelled, about fifteen or sixteen times in a minute, so as to simulate respiration.

30. *d.* The *external* and *internal* use of stimulants has been recommended by J. P. FRANK and DEVERGIE. Of this class of means, *galvanism* holds the first place; but it is seldom that an apparatus can be procured. When it can be obtained, slight shocks may be directed through the diaphragm or heart; or if an electric apparatus is at hand, as strong shocks of electricity as the machine can furnish may be tried. Whilst we are proceeding with insufflation of the lungs, *frictions* of the surface of the body, particularly over the chest, on the insides of the thighs, &c., in order to promote the circulation and the animal heat, should be continued; and the nostrils may be irritated, or touched occasionally with a feather dipped in spirits of hartshorn or of aromatic vinegar. Substances which are likely to increase the coldness of the surface by their evaporation should not be employed by friction. The introduction of *warm stimulating fluids* into the stomach, by means of a flexible tube and syringe, has been recommended, and may be tried after insufflation of the lungs has been performed for a short time. More advantage, however, will probably accrue from the administration of a clyster of warm spirits and water than from the injection of stimulants into the stomach, unless this can be done with an apparatus admitting of easy application. Tobacco-smoke has also been directed to be thrown up the rectum; but it is a more uncertain remedy than the clyster now mentioned.

31. *e. Bleeding* is one of the measures respecting which the greatest difference of opinion has existed. In certain circumstances it is often of great service, and in others detrimental. It is generally proper when the countenance is swollen, injected, or purplish; the veins full or distinct; and the skin reddish, or approaching the violet tint. It is not always, however, possible to obtain blood; but even when we fail in procuring it, the opening which had been made should be carefully closed and bandaged, in order to prevent subsequent hæmorrhage, which may occur when least expected. Bleeding is also often required during the progress of recovery, particularly when the respiration is laborious, the brain loaded or oppressed, and when delirium, the not infrequent attendant on restored animation, is present.

32. *f.* The means now recommended, particularly frictions, inflations of the lungs, and the occasional use of stimulants, should be persisted in for several hours, unless stiffness of the limbs, and other indications of death, present themselves. Convulsive snatches of the respiratory muscles, with gaspings, followed by sighing, a more natural respiration, and slight palpitations, are the first signs of returning animation. When the circulation is restored, convulsions sometimes take place, and suddenly destroy the patient. Such seizures may occur even a considerable time after recovery has apparently been effected. The patient should therefore be watched for several days; and if an attack of this kind occur, blood-letting, and artificial respiration during its continuance, may save the patient. *Delirium,* and all the forms of morbid reaction which occasionally appear recovery from asphyxy, require depletions, with the means usually employed to restore the secretions and excretions, and to excite the emunctories to carry off the hurtful materials accumulated in the blood during the state of asphyxy.

33. VII. TREATMENT OF PARTICULAR KINDS OF ASPHYXY. — *A.* Of *asphyxy from submersion.* But little, in addition to what has been stated above, need be adduced under this head. The body should be carried from the place of submersion to where means of restoration are to be used, in the recumbent posture, with the head and shoulders elevated; but neither of them bent, or hanging in an injurious posture. The wet clothes are to be immediately removed, the

mouth and nostrils cleansed; and the body placed in warm blankets: this should be done as soon as the body is found, if the weather be cold, and the distance to the place where resuscitation is to be attempted be considerable. The directions given in preceding paragraphs (§ 27. *et seq.*), are now to be followed. Some advantage will be derived from placing the body in a warm sun, or before a fire, or surrounding it with dry warmth; heated substances may likewise be applied to the epigastrium, the extremities, and insides of the thighs. Where a warm bath can be readily procured, the body may be placed in it, and the temperature regulated to about 98° or 100°. *Animal heat*, proceeding from some of the domestic lower animals or from a healthy person placed by the side of the body, is, especially in the cases of children, a very efficacious mode of resuscitation. But all these means should not interrupt the performance of artificial respiration. The other measures recommended in the foregoing section may also be resorted to, with the exception of *bleeding*, which is seldom beneficial until the circulation has been restored; when it will not infrequently be required, to subdue morbid reaction, in conjunction with other remedies calculated to restore the secretions, &c. (§ 32.)

34. *B. Asphyxy from strangulation* requires the same measures which have been described under the head of *general treatment* (§ 26. &c.), and particularly *bleeding*, which may generally be advantageously performed in the jugular vein. The head and shoulders ought to be raised as high as may be consistent with the means used for resuscitation; and, if a restoration of animation be effected, the usual means of guarding the brain from the ill effects of reaction or congestion, to which this organ is more liable after strangulation than after asphyxy from other causes, are to be put in practice.

35. In cases of asphyxy from *obstruction of the glottis and larynx*, or from substances having passed into this situation, or into the *trachea*, the operation of *tracheotomy* should be resorted to. Several instances of this description have been recorded, wherein it has been successfully performed. In all cases of recovery from asphyxy, the patient should be carefully watched for two or three days, and every appearance of reaction affecting any organ, more particularly the brain, instantly subdued by means appropriate to the circumstances of the case. Pure air, and the use of deobstruent purgatives and diuretics, are generally necessary, in order to purify the circulating fluid, and change it from the unnatural state it had assumed during the asphyxy.

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1. ASPHYXY of New-born Infants is frequently met with, particularly in those who are naturally feeble, or weakened by rupture of the chord or laceration of the placenta, in consequence of sudden delivery, or of the operation of turning, especially when required by uterine hæmorrhage. It is also occasioned by compression of the chord, and a protracted parturition.

2. Besides the absence of respiration and of muscular motion upon delivery, the surface is pale; the flesh and limbs are soft and flaccid; the heat of the body is rapidly diminished, but the circulation still continues, at least for some time. Several cases which are viewed as *asphyxy*, more properly belong to *syncope*, or *loss of blood*, or participate in those states as well as in *privation* of the respiratory actions. This privation may depend upon imperfect circulation in the pulmonary arteries, and through the lungs; or upon inactivity of the respiratory muscles, and torpor of the nerves which supply them, owing to imperfect circulation in the brain; or upon these causes conjointly. Care should be taken to distinguish these cases from apoplexy; as the states of the vascular system, and of circulation in the brain, and consequently the treatment which is required in each, are very different.

3. The *treatment* of these cases consists of deferring the ligature of the chord for some time; of taking care that no blood is lost from dividing it; of enveloping the infant in warm flannel; of holding it near a warm fire, or plunging it in a warm bath, rendered exciting by means of salt or mustard; of removing all obstruction to the passage of air into the lungs from about the throat and mouth; warm frictions of the surface of the chest, with gentle succussation with the palm of the hand on the shoulders; tickling or irritating the nostrils and arm-pits with a feather; dropping a little diluted aromatic, or ammoniated spirit upon the lips; and most particularly inflation of the lungs by the breath of the medical attendant, either blown directly into the mouth, the nostrils being closed, and the trachea gently pressed backwards; or through a curved tube introduced into the larynx, as recommended by Chaussier, and employed by him at the "*Maison d'Accouchemens*" in Paris. This latter method is certainly preferable. Insufflation is to be managed in the same manner, in other respects, as described in the foregoing article. But I think that the breath of the attendant is better suited to infants, than cold air thrown into the lungs by a bellows.

4. M. Desormeaux complains of his want of success from inflation of the lungs, even when carefully and assiduously employed, and places more dependence upon means calculated to excite the respiratory muscles to contract. For this purpose, he recommends a species of spirit douche, and directs the practitioner to take a mouthful of brandy, and dash it forcibly against the anterior parietes of the chest. He states that this is seldom required oftener than twice or thrice. Mechanical irritation of the nostrils, or exciting

powders applied to the pituitary membrane, may be cautiously tried; a stimulating clyster may also be thrown up. Galvanism or electricity may likewise be resorted to when within our reach. We should not relinquish our endeavours at resuscitation under two or three hours, or even longer; and, if we ultimately succeed, the state of the infant should be carefully watched for two or three days.

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ASTHMA. DERIV. and SYNON. Ἆσθμα, anhelatio: from ἄω, I breathe; ἀσθμάζω, I breathe with difficulty. *Suspirium*, Celsus, Seneca. *Dyspnœa Spastica*, Auct. Var. *Myspathica Spastica*, Ploucquet. *Asthma Chronicum*, J. P. Frank. *Asthma Convulsivum*, Baglivi, Alberti, Hoffmann, Sauvages. *Asthma Spasticum*, Juncker. *Pneusis Asthma*, Young. *Asma*, *Bolsuggine*, Ital. *Pousse*, *Asthme*, Fr. *Die Engbrüstigheit*, *das Keuchen*, Ger.

CLASSIF. 54. *G.* Asthma; 3. *Order*, Spasmi; 2. *Class*, Neuroses (*Cullen*). 4. *G.* Asthma; 2. *Order*; 2. *Class* (*Good*). 37. *G.* Asthme Convulsif; 4. *Order*; 4. *Class* (*Pinel*). II. CLASS, III. ORDER (*Author*, see *Preface*).

1. DEFIN. *Great difficulty of breathing, recurring in paroxysms, accompanied with a wheezing sound, sense of constriction in the thorax, anxiety, and a difficult cough, terminating in mucous expectoration.*

2. There are few diseases, the nature of which has been a subject of greater doubt and difference of opinion than asthma. Until the writings of FLOYER, WILLIS, HOFFMAN, ALBERTI, and JUNCKER, directed particular attention to its pathology, it was generally confounded with dyspnœa, being usually denominated intermittent or remittent dyspnœa. By these writers, and more recently by SAUVAGES, CULLEN, PINEL, and GEORGET, asthma was considered as essentially nervous in its nature; and the lesions found upon the dissection of fatal cases viewed as its consequences, and not as its causes. More recently, and even at the present day, among many, it has been considered as a symptom of organic change of either the heart, large blood vessels, or of the lungs, air-tubes, &c. But this doctrine, although generally accurate in respect of DYSPNŒA, is quite erroneous as applied to asthma.

3. PATHOLOGY OF ASTHMA. — The dependence of dyspnœa, not only upon organic lesions of the organs seated within the chest, but upon the form of the thorax, upon diseases of adjoining viscera, and upon the state of the air-passages, is sufficiently obvious. The difficulty of breathing proceeding from these sources may be either continued or remittent; but it never is, whilst the causes on which it depends are in existence, characterised by intervals of perfect ease. True asthma, however, presents intervals of healthy respiration; and although repeated returns of the attack will generally induce some change in the organisation of either the lungs or the principal organs of circulation, yet this is not uniformly the case; and moreover, an attentive examination of the thoracic viscera, in recent attacks, fails of detecting in them any appreciable change, particularly during the intervals between the paroxysms. The disease has even proved rapidly fatal during the attack, and yet no alteration adequate to account for the symptoms could be detected on dissection. Instances of this description have been adduced by WICHMANN (*Hufeland's Journ.* b. i. p. 18.), PARRY, GEORGET, ANDRAL, LAENNEC, and GUERSENT, and justify the opinions of those who have referred the disease chiefly to the nervous system. In some cases, after repeated returns of the attack, and when they have induced organic change, the intervals are less distinctly marked, consist of remissions merely, and the disease may, at last, pass into confirmed dyspnœa.

4. *a. The structure of the air-passages and bronchi* evidently shows that these parts are susceptible of preternatural or spasmodic constriction. During 1821 and 1822, when engaged in some researches into the pathology of diseases affecting the trachea and bronchi, I was enabled distinctly to trace muscular fibres throughout those parts, both in man and in the lower animals. The disposition of those fibres, in many of the lower animals, and the mode of their connection with the cartilaginous rings, are peculiar, and beautifully adapted to guard against the contingencies to which they are liable from varying positions and habits of life. Upon those, however, I cannot here enter. About the same time that my attention was directed to this subject (*Lond. Med. Repository*, vol. xxii. p. 418.), the researches of REISSEISSEN of Berlin, and of LAENNEC and CRUVEILHIER of Paris, appeared; and the results, in respect of the structure of the bronchi and larger ramifications of the trachea, upon the whole, agree with what I had observed. It had been denied that the membraneous, or any other, part of the air-passages contain muscular fibres. But this was asserted chiefly by those who cannot believe that a part is muscular, unless the fibres are the same in appearance as those which enter into the composition of the muscles of voluntary motion. Other anatomists, who take a more comprehensive view of the conformation and functions of the muscular system, consider, with greater justice, that the muscles which are acted upon by the will, form an order by themselves; and that there is another and a very important order of muscular parts, which are not directly influenced by volition, but which contract from stimuli acting on them, either immediately or mediately, and which present certain peculiarities in respect of the appearances of their fibres, of the mode of their distribution, and of the manner of their connection with internal tissues and organs. Now, the fibres which are discovered in the trachea, and traced to the smaller ramifications of the bronchi, are in every respect similar to other involuntary muscular fibres, in their organisation; in their connection with a mucous surface, forming, in many respects, a tunic concentrically with the mucous coat; in being disposed in circular fibres, surrounding hollow tubes; and in being supplied entirely by ganglial or involuntary nerves. The disposition of the fibres, therefore, which are detected in the air-passages, being altogether similar to that which obtains in other canals, the muscular structure of which is not disputed, as in the alimentary tube and urinary bladder; the organ-

isation of the fibres being also similar; their connection to a mucous surface, and the circumstance of their being supplied with the same order of nerves, being at the same time considered; are we therefore to be surprised that agents affecting either the mucous surfaces thus related to them, or the nerves supplying them, should be followed with analogous effects to those which we observe after the action of agents directed to the mucous surface or nerves of the alimentary canal?

5. *b. The lungs possess a vital power of expansion.* — The structure of the air-passages, then, would lead us, independently of the results of observation, to infer that the circular fibres are liable to experience, with all other involuntary muscular fibres, a spasmodic constriction; and it evinces, particularly in the conformation of the cartilaginous rings with which the trachea and larger ramifications of the bronchi are provided, a marked provision against an inordinate continuance or degree of this constriction; the rings, by their permanent elasticity, acting as antagonists to the circular fibres, preventing extreme constriction, and at last overcoming long-continued spasm, particularly in those larger branches, the inordinate constriction of which might have the effect of excluding the air from a very large portion of the lungs. In the larger ramifications of the bronchi, the muscular fibres connecting the extremities of the cartilaginous rings are thus antagonised by these rings; but, in the smaller ramifications, where the rings cease to be detected even in the imperfect forms in which they there exist, and where the fibres are perfectly circular, the only provision which can prevent an inordinate constriction of those fibres, is in the structure of the lungs themselves, which must necessarily undergo a change in bulk, and become more condensed by this constriction, in those parts, at least, to which the spasm extends; unless we believe that the lungs, like various other organs, are endowed with an expansive power, — a power which physiologists and pathologists have too much overlooked in their exposition of the healthy and morbid actions of the animal economy.*

6. The mechanism of the expansive power is so little understood, and generally so insufficient for the explanation of this phenomenon, that we must refer chiefly to the vital actions of the part, which must necessarily depend on the energies of the body generally. The expansile action of the penis, nipple, heart, uterus, &c. cannot be explained by their organisation only: it is manifested to us only during life, and the perfection as well as imperfection of this action are always accordant with the degree of vital energy with which these organs are endowed.

7. I have long since had occasion to remark that the motions and functions of the lungs (*Physiological Notes, &c. to* M. RICHERAND'S *Physiology*, 2d ed. p. 628.) have been too generally and exclusively referred to the mechanism of the respiratory organs, and to chemical changes produced in the lungs, to the neglect of a much higher influence, always controlling, modifying, or altogether changing, the subordinate powers to which their functions have been thus referred. That the vital energies of the frame are most powerfully exerted in the lungs, through the medium, especially of the organic nerves with which they are provided, must be evident to all who will contemplate the nature and extent of the changes constantly taking place in these organs upon the blood circulating through them; and the relation which subsists between their functions and the vital energies of the system generally. Now, it does appear to me that there exists a vital expansion of the lungs independent of that which they experience from atmospheric pressure, and from following the dilated parietes of the thorax during inspiration. In experiments upon living animals, where the walls of the chest have been opened, the lungs are observed to swell and contract alternately. This fact, which was first insisted upon by M. ROUX (*Mélanges de Chirurg.* p. 87.), has since been duly appreciated by PRUS, LAENNEC, and a few others. Even in cases where the portion of lung has protruded itself after a wound of the chest, — a circumstance which could only occur from active expansion of the lung itself, — this portion has been, although thus unnaturally placed and subjected to the pressure of the atmosphere, observed to dilate during inspiration. The not infrequent occurrence of ossification of the cartilages of the ribs in old persons, and consequent perfect immobility of the ribs, even without any evident dyspnœa, furnishes another proof of the inherent expansibility of the lungs: for without having recourse to this vital property, we cannot explain the performance of the actions of inspiration and expiration by the diaphragm alone.

8. This vital property, therefore, with which the lungs, in common with some other organs, seem to be endowed, together with the disposition and elasticity of the cartilaginous rings of the bronchi, furnishes an antagonising force to the unnatural constriction of the tubes from spasm of their circular fibres; and, while it serves to explain the natural functions of the organ, with their modifications from the various influences to which this property is subjected, is one of the sources to which we are to impute some of the diseases, and more especially the one under consideration, to which the lungs are liable.

9. Having thus shown, from the structure of the air-passages that they, in common with all other hollow tubes of the body, admit of spasmodic constriction, and that they also present a provision against the undue extent or continuance of this state, I should further remark, that a close observation of the phenomena of disordered respiration is sufficient to convince us that they frequently experience this state, owing to the operation of certain causes acting either directly on the mucous surface of the tubes, and impressing the nerves terminating in it, or originating in and irritating the nerves themselves, either at their origins or in their ramifications and connections.

10. I. SYMPTOMS AND HISTORY OF ASTHMA. — The *premonitory* symptoms of this disease are languor, sickness, flatulency, and other dyspeptic

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* That the lungs, however, really possess this property, may be inferred from the permanent elasticity of their structure, which continues for some time after death; and which is still more marked during life, as shown by exposing the lungs of a living animal. This state may be with propriety called the vital expansibility of the lungs, inasmuch as the degree of this state is chiefly dependent upon the vital energy of the system, and partly on the peculiar organisation of the lungs themselves.

disorders; heaviness over the eyes, and headach; uneasiness an anxiety about the precordia, with a sense of fulness and straitness in this region and in the epigastrium. In some cases pain is complained of in the neck, with uncommon drowsiness and stupor. It is also often preceded by costiveness and inefficient calls to stool.

11. *A.* The *invasion* of the attack of *spasmodic asthma* is generally soon after midnight, or about one or two in the morning, and during the first sleep. The patient wakes suddenly from a sense of suffocation. He feels a most distressing tightness at his chest, with great anxiety, difficulty of breathing, and impediment to the free admission of air into the lungs. He assumes with eagerness the erect posture, and cannot bear the least incumbrance about the chest. The breathing is wheezing, interrupted, and laborious. The shoulders are raised, the elbows directed backwards, and every effort made to enlarge the thorax. Owing to the interrupted circulation through the lungs and heart, the countenance, which was at first pale and anxious, becomes, particularly in plethoric habits, red or bloated, and covered with perspiration. The eyes are prominent, and the conjunctiva injected. A considerable quantity of pale urine is usually passed at the commencement, or previous to the accession, of the paroxysm; and the lower extremities are usually cold. The pulse is generally accelerated, weak, irregular, and often intermittent. During the fit, the patient has commonly an instinctive desire for cool fresh air, which always revives him. A small or close room is offensive, and all warm substances given internally increase the flatulency of the stomach and bowels, and aggravate the symptoms. When the fit has continued from half an hour to one, two, three, or even four hours, it leaves the patient; and his respiration, pulse, and feelings assume their natural state.

12. This is the common course of a first and moderate attack of the disorder. Sometimes the patient has but one such fit; but more generally a slight constriction of the chest is felt through all the succeeding day, and the paroxysm returns at the usual period of the night; and this continues for three, four, or even seven days; when the patient is at last altogether relieved from the attack. The disease may be suspended for a month, or several months; but it is liable to recur from changes of air, errors of diet, and from the operation of the other causes productive of it.

13. In some cases the attack is more severe from the commencement, and continues, with slight remissions for several days, accompanied with a harsh suffocative cough, great distension of the abdomen from flatus, and more or less of the symptoms which characterise the complaint in the severer states resulting from repeated attacks.

14. When asthma once seizes on the system, it seldom fails of recurring, though the intervals between the paroxysms are of very uncertain duration. In many cases it recurs periodically every ten days or a fortnight. Sometimes the attack returns at the full and change of the moon, or at one of those periods only. It has been observed to recur in females just after the menstrual discharge, or to precede this evacuation. Persons who have become subject to the disease seldom escape an attack in the spring and autumn.

15. After repeated seizures, the disease often assumes the most violent and distressing features; the difficulty of breathing in the fit amounts to the utmost degree, and is attended with the greatest tightness over the whole chest, the patient feeling as if he were bound with cords. His anxiety at this period is inexpressible, and he labours in respiration as if every moment would be his last. Severe vomiting also frequently occurs. The matter discharged is slimy and frothy, or of a greenish yellow colour. He is subject to palpitations and faintness; and cool fresh air becomes absolutely necessary. About this period a loose stool sometimes takes place. The eyes are prominent, the face sometimes pale, sometimes high-coloured, bloated, or livid: the nose and ears are cold; the face, neck, and chest, covered with perspiration. The pulse is generally extremely weak, irregular, and even intermitting: there is often much difficulty of swallowing. The patient can scarcely speak, cough, or expectorate, and the stomach and bowels are much distended with flatus. As the paroxysm abates, the cough becomes freer, and is attended with the expectoration of a little viscid mucus; and, in proportion as the cough and expectoration increase, the distressing symptoms abate; this evacuation, which had been retained by the spasm of the air-vessels, indicating a solution of the spasm and a freer access of air to the cells of the lungs. An easy and free expectoration, particularly if it be accompanied with softness and moisture of the skin, and a sediment in the urine, is a certain indication of the subsidence of the attack. Sometimes when the paroxysm is unusually long, the patient experiences only a single occurrence of it during the attack.

16. *B.* The *Humoral* form of asthma is generally gradual in its accession, and attended by extreme oppression, a suffocative cough, and a copious secretion and expectoration of mucus from the commencement of the seizure (§ 11.). It is sometimes the consequence of repeated attacks of the preceding variety; and is generally more severe and of longer duration than it, owing to the accumulation of viscid mucus in the air-vessels conspiring with the spasm it occasions to aggravate the symptoms. There are also less perfect intervals of ease in this form of the malady, than in the spasmodic. After the subsidence of the patient's sufferings during the first night of the attack, and while the expectoration is easy and copious, the lungs still continue irritable through the day, and the respiratory function embarrassed from the slightest causes. At the approach of night, the fit recommences with the usual symptoms, and the night is passed nearly as the former. On the third day the remission is more complete, there is some additional expectoration, and bodily motion is performed with less distress, but still with great inconvenience. After the paroxysm has been renewed in this manner for three or four nights, or for a longer period, sometimes for several days or even weeks, — for the duration of an attack varies much, — the expectoration and cough are more easy and free, the daily remissions become more perfect, and the strength of pulse and vigour of action increase.

17. When the chest is examined by the ear or

stethoscope, the sound of respiration is weaker during the fits, than in the intervals, but it is seldom altogether suspended in certain points of the chest; it is attended by a sonorous rattle, flat or sibilous, imitating the chirping of birds, the note of a violoncello, or the cooing of the wood-pigeon. With this there is frequently intermixed a mucous rattle; but this conveys the impression of being produced by a thinner fluid than the mucus of common catarrh. In the intervals of the attacks, these various species of rattle exist, but in a much less degree. The respiratory sound is louder than during the paroxysms: sometimes it is almost puerile. If the complaint have occasioned dilatation of the bronchi, the respiration assumes more or less the character of the variety called bronchial; in all cases it varies in intensity at different points of the chest, and these points change their situations from day to day (LAENNEC). The chest generally sounds well, throughout the attack, upon percussion.

18. I have stated (§ 16.), that the humoral form of asthma is often consequent upon repeated attacks of the spasmodic; but this latter may also occur, although rarely, after the former; or the attacks in some persons present an evident complication of both forms of the disease. The stomach and bowels are extremely liable to disorder in asthmatic persons, particularly in those subject to the spasmodic form of the disease. Colic pains, flatulence, loss of appetite, an irregular state of the bowels, and a disturbed, impaired, and unrefreshing sleep, generally harass the asthmatic patient, even in the intervals between the seizures. In females, the menses are generally impaired or irregular, and an attack often precedes the period of the menstrual discharge, the supervention of which generally acts as a crisis of the attack.

19. Symptoms of fever are not essential to the disease, though they often occur, especially when the humoral asthma, or an attack of catarrh, is complicated with the convulsive. Hectic fever, colliquative diarrhœa, faintings, palpitations, vomitings, coldness of the extremities, swelled legs, and other dropsical symptoms, are common in the last stage of the disease, and indicate organic changes in the substance of the lungs or heart, with obstruction to the circulation in these organs, and effusion of fluid in the chest, — results, however, which can only be ascertained with precision by means of auscultation and percussion.

20. *C. Terminations.* — An attack of asthma generally terminates in one of three ways: — 1st, By a return to the healthy function: 2d, By inducing further lesion; in which it either disappears, or becomes complicated: and, 3d, In death. On each of these I shall offer a few remarks.

21. *a.* Although the paroxysms of asthma frequently terminate in a return to the healthy functions, a perfect immunity from future attacks can rarely be procured. Yet these attacks may be frequent, severe, and of long duration, recurring for a long series of years; the patient, notwithstanding, arriving at a very advanced age, before a fatal issue takes place. But they often produce the following organic lesions.

22. *b.* The most common consequences of the disease to which I may now advert, are, chronic inflammation and dilatation of the bronchi the different forms of emphysema and œdema; of the lungs; hæmoptysis; tubercular formations, with which asthma may also be associated from its commencement; enlargement, and dilatation, &c. of the cavities of the heart; effusions of fluid in the pleura or pericardium; and wasting of the heart, or polypous concretions, within its cavities. As the reader will find all those lesions treated of under their distinctive heads, I shall here only remark respecting them, that, when they supervene to asthma, many of the distinctive characters of this disorder entirely disappear in those of the superinduced disease, and the lesions of the respiratory functions assume the distinctive features of chronic, continued, or remittent dyspnœa. Severe attacks of asthma may also terminate in congestions or effusions within the head, giving rise either to epilepsy, coma, or apoplexy.

23. It was already remarked, that auscultation and percussion furnished merely negative information in the different forms of asthma. But this information is still important, inasmuch as it intimates the non-existence of any of the foregoing organic changes; and, when they do exist, those means of diagnosis enable us not only to recognise them, but also to ascertain with precision their nature, progress, and extent, and thus to form an accurate diagnosis and prognosis in respect both of the primary disease and of the consecutive organic changes.

24. *c.* When the disease ends in death, this event is brought about generally by superinducing some one of those changes already referred to as terminations of the disease, or of those lesions, with which it is frequently associated (§ 22.). Death may, however, occur, but much more rarely, from the severity of the attack; the requisite changes not being effected on the blood by respiration, owing to the obstructed state of the air-vessels, either from spasm or the accumulation of viscid mucus, or from both, whereby the nervous centres are supplied with blood unsuitable to their functions, and the heart ceases to contract with sufficient energy to preserve the circulation in a requisite state of activity through the lungs and brain.

25. *D. The appearances after death* may be inferred from what has already been stated. These appearances are rather the consequences of the disease, than the disease itself; for it is seldom that we have an opportunity of examining the body in recent and uncomplicated cases of asthma. Where, however, this has been done, the lesions, even when any have been detected, have been insufficient to account for the disease. WILLIS records a case of protracted asthma, in which no morbid appearance could be detected; and similar cases have occurred to LAENNEC, ANDRAL, CRUVEILHIER, BOUILLAUD, JOLLY, and others. FERRUS, after extensive experience, states that he has been unable to detect any lesions which can be attributed to uncomplicated asthma. The changes which have been noticed, therefore, by authors, are to be viewed chiefly as accidental occurrences, or associated maladies; and, perhaps, more frequently as the remote results of repeated or protracted attacks. The appearances usually observed in fatal cases are the same as have been described (§ 22.).

25. II. VARIETIES OF ASTHMA, AND OF THEIR PATHOLOGY. — SAUVAGES has enumerated no less

than eighteen forms of this disease, many of them presenting no modification of the phenomena constituting the disease, but merely peculiarities as to cause, particularly as respects the occasional causes. Several of his varieties, also, strictly belong to the more generally symptomatic complaint to which the the term Dyspnœa is usually applied. The varieties of idiopathic asthma, according to Cullen, are the Spontaneous, Exanthematic, and Plethoric. Dr. Bree, who has given a comprehensive account of the disease, has divided it into forms which have reference chiefly to the doctrine which he has espoused respecting its pathology. He assigns to it four species: — 1st, Asthma produced by the irritation of effused serum in the lungs; being its most common form: 2d, That occasioned by the irritatation of aërial acrimony in the lungs: 3d, That dependent on irritation in the stomach, or some of the abdominal viscera: and, 4th, That dependent upon habit. Dr. Young has adopted a similar arrangement.

26. M. Laennec has given a simpler view of the disease, and assigns it two forms, viz. asthma attended with *puerile respiration*, in which the vital expansibility of the lungs is increased, from a temporary augmentation of the want of the system for respiration, occasioned by some unknown modification of the nervous influence; and *spasmodic asthma*, from a spasmodic constriction of the air-tubes. Dr. Good has divided the disease into the *dry* and *humid;* but he has encumbered these two species with nearly as many varieties as have been assigned by Sauvages. The *dry* or *nervous* asthma he subdivides into the simple, metastatic, phlegmatic, vaporose, and organic, — a refinement which is neither founded in nature, nor can be available in practice; for a simple nervous asthma may be induced by injurious vapours, or by repelled eruptions, and hence we have the first variety produced by either his second or fourth; and the second, or the phlegmatic nervous asthma, may proceed from the same varieties. His fifth variety is certainly not admissible under asthma, unless as a consequence of the disease, but falls more properly under dyspnœa, either in its continued or remittent forms. The Humid or *common* asthma he subdivides into the simple, plethoric, and atonic, — a division much more accurate than the foregoing, but still objectionable, inasmuch as it is impossible to draw any line of demarcation between them, and as the three varieties insensibly pass into one another.

27. By the great majority of authors who have written on the disease, it has been viewed simply in respect of its Idiopathic and Symptomatic forms; both, however, presenting modifications resulting from peculiarity of causes, and the circumstances of the patient, but insufficiently marked to constitute distinct varieties. In the following observations I shall observe the same distinction, and divide the Idiopathic form of the disease into, 1st, The *nervous* asthma; 2dly, The *primarily spasmodic* asthma; and, 3dly, The *pituitous* or *humid* asthma.

28. 1st, *Nervous Asthma.* The asthma with puerile respiration, *Laennec.* — Char. *Anhelation from a feeling of want of a more complete respiration than the patient enjoys, the pulmonary expansion distinctly taking place with promptitude, completeness, and uniformity, so as to furnish a general puerile sound on auscultation; usually accompanied with a slight cough, and with a free mucous expectoration.*

29. This form of the disease was first accurately described by Laennec, who pointed out the difference between it and the forms depending on spasm of the air-tubes. In this variety no spasm seems to exist in the smaller air-vessels and cells; for the whole tissue of the lungs is dilated to its full capacity, and with unusual promptitude and completeness, so that the puerile respiration is heard in every part of the chest; whereas in the other varieties the respiration is generally somewhat more indistinct than in health. M. Laennec contends, and apparently with justice, that the wants of the system, in respect of respiration, may be exactly measured by the intensity of the respiratory sound; and that the intensity varies much, according to many circumstances, and particularly according to the age of the individual, it being much greater in childhood than in adult life. There is no morbid affection, he observes, which can be more satisfactorily referred to simple disorder of the nervous influence, than this dyspnœa accompanied with puerile respiration. In cases of this kind, the respiratory sound has resumed all the intensity which it possessed in early life. The pulmonary expansion evidently takes place completely and rapidly in all the air-cells, and yet the patient feels the want of a more extensive respiration than he enjoys; and the lungs, although dilated to their utmost, have not, nevertheless, capacity enough to satisfy the wants of the system. This affection is common in persons affected with chronic mucous catarrhs, attended by a copious and easy expectoration; but even in them, during the severest attacks, the completeness with which respiration is performed is quite astonishing. Nevertheless the patient feels oppressed, and requires a more extensive respiration than his organisation allows; the wants of the system in respect of this function being increased beyond the standard of health.

30. In this form of the disease it is not in the small air-tubes that we are to look for its proximate cause, but in the trachea and large bronchial trunks, and particularly in the nervous influence itself; and this will equally hold good even if we adopt the chemical theory of respiration, and refer the affection to an extraordinary want of oxygen in the blood, arising from impeded function of the respiratory mucous surface, owing to the mucous secretion covering it. M. Laennec believes, as this species occurs only in persons affected with chronic mucous catarrh, that it can never amount to asthma, without the catarrhal complication. Adults and old persons, he remarks, who have puerile respiration without catarrh, are not, properly speaking, asthmatic; but they are short-breathed, and dyspnœa is induced by the slightest exertion, though when sitting still they frequently experience no oppression whatever.

31. This variety may be considered as depending upon a temporary augmentation of the want of the system for respiration, occasioned most probably by some unknown modification of the nervous influence; and apparently consisting in an expansile action of the lungs increased much beyond the healthy standard. But here a ques-

tion suggests itself, viz. can this augmented action of the lungs be owing solely to the state of this organ, or is it associated with, or partly depending upon, increased activity of the respiratory muscles, particularly the diaphragm? M. LAENNEC states that it cannot be produced at will by a full inspiration; and, therefore, infers that this state of the lungs is a primary condition of them, and not depending on increased inspiratory efforts.

32. From this consideration I am led to infer that, although the vital expansile action of the lungs may be increased in this variety of asthma, it is accompanied with, and much assisted by, augmented activity of the diaphragm, which performs its office more promptly and completely in this variety of asthma than in any other; that instead of the disease being characterised by spasm of the smaller ramifications of the bronchi and air-cells, as in the second variety of asthma, the air penetrates more fully into them than usual; and that, if any spasm exists, it is limited to the trachea and large bronchial tubes; the exalted state of expansion of the lungs, and of function of the diaphragm, being an effort to counteract this morbid condition of the large tubes, and to supply the wants of the system by a more forcible inspiration; the increased rapidity with which the air is thereby made to pass through the strictured canals making more than amends for the diminished calibre of the passage. This form of the disease is frequently *symptomatic* of nervous affections, particularly of hysteria when the globus hystericus affects the state of the trachea, and of various diseases, in which the blood is imperfectly changed in its circulation through the lungs. But when thus symptomatic, it is often slight and evanescent.

33. 2d, *Spasmodic Asthma*. SYN. Periodic Asthma. Convulsive Asthma, *Willis*, *Baglivi*, *Boerhaave*. Asthma Siccum, *Musgrave*. Occult dry Asthma, *Etmuller*. Spasmodic Asthma, *Laennec*. Dry Asthma, *Good*.—CHAR. *Paroxysms sudden, violent, and of short duration, attended with hard spasmodic constriction in the chest; slight, dry, and difficult cough, and with a scanty expectoration, occurring only towards their close.*

34. I stated that the vital expansive action of the lungs was increased in the foregoing variety. In this the ramifications of the air-tubes, and perhaps the air-cells themselves, seem to be unnaturally constricted. The respiration, when examined by the stethoscope, or by the ear merely, is heard either very imperfectly even on the most forcible respiration, or to a small extent only, or its sound may be but little impaired. The chest, during the paroxysm, sounds ill on percussion. These phenomena indicate that there is an imperfect entrance of the air into the air-cells. M. LAENNEC states, that if the patient, after holding his breath nearly as long as he can, breathes quietly, the spasm will often be overcome as it were by surprise, and the entry of the air into the cells will be heard in a clear or even puerile sound. This, and various other circumstances, independently of the proof furnished by the structure of the air-tubes, indicate that the obstruction to the entrance of air into the cells is owing to spasm of the muscular fibres.

35. Dr WILLIAMS believes that spasmodic asthma may be partial, affecting one lung only, or one more than the other; but this is very seldom the case, unless when it is occasioned by, or complicated with, dry catarrh, which is sometimes partial; or when the spasmodic constriction is excited by a collection of a pituitous fluid in some of the bronchi,—a complication of not infrequent occurrence, but falling more strictly under the next form of the disease. Although the paroxysms of the primarily spasmodic asthma are sudden, and generally of short duration, yet the disease is often of long continuance, and may, to a certain extent, become habitual, as shown by Dr. BREE and others.

36. During the spasm, the lungs seem, from an attentive examination of the thorax, somewhat drawn together, owing to the constriction of the air-tubes; and the parietes of the chest, being necessarily pressed inwards at the same time, generally yield a less clear sound on percussion. The serobiculus cordis is also drawn inwards and upwards, indicating the manner in which the diaphragm is affected during the paroxysm. This phenomenon, which was first pointed out by SCHEIDEMANTEL (*Fränkische Beträge*, No. 5.), arises either from the diaphragm being prevented from contracting to its full extent by the spastic constriction of the air-vessels, or from a temporary paralysis of this muscle. That the latter state should take place, and be followed in a short space of time by a perfect restoration of action, and that repeated seizures of this description should be always succeeded by a similarly rapid return to the healthy state, cannot be admitted by any person who takes an intimate and comprehensive view of the operation of the animal economy in health and disease. That retraction of the epigastrium, and even of the hypochondria, is owing to imperfect descent of the diaphragm form constriction of the air-cells, seems proved by the circumstance, that the pleural cavity is perfectly closed, and forms nearly a vacuum, and consequently the capacity of the thorax cannot be enlarged by the action either of the diaphragm or of the other respiratory muscles, without the expansion of the lungs. But this organ is only imperfectly expanded, owing to the spasm of its air-vessels; consequently the diaphragm either cannot assume its usual place, or does so imperfectly, notwithstanding its efforts to accomplish this end; and the parietes of the thorax are every where pressed inwards, following the retracted state of the lungs themselves, and are only partially dilated after the most energetic action of the respiratory muscles, which at last overcomes the spasm of the air-tubes, as the want of respiration throws the former into spasmodic action, and tends to relax the spastic state of the latter.

37. This condition of the air-vessels, and the antagonising action of the respiratory muscles during the paroxysm, have a necessary tendency to form a vacuum in the thoracic cavity; but this can take place to a very small extent only, as the action of the respiratory muscles is insufficient to overcome both the pressure of the atmosphere surrounding the chest, and the spastic stricture of the air-tubes, as long as this stricture continues in full force. The consequence, however, of this antagonising action and tendency to form a vacuum is, that a larger quantity of blood is drawn into the large veins within the thorax, and

into the venous sinuses and auricles of the heart, occasioning congestion of those cavities, impeded circulation through the lungs, congestion within the head, and inordinate and irregular action of the heart, with various other injurious effects upon the central organs of circulation, as well as upon the cerebro-spinal centres.

38. In addition also to these effects, which take place during the antagonising struggle characterising the paroxysm, rupture of one or more of the air-vessels or cells sometimes takes place, in consequence of the violent action of the inspiratory muscles on the one hand, and the unyielding state of constriction of the air-vessels on the other (§ 136.); and emphysema of the lungs is superinduced, forming one of the most common lesions found upon dissection of fatal cases, and in the opinion of some pathologists the proximate cause of the disease. (See Emphysema.)

39. 3d, *Common or Humid Asthma.* — Syn. Catarrhal Asthma; Continued Asthma; Humoral Asthma; Pituitous Asthma. Spitting Asthma, *Floyer*. Asthma Humidum, *Riverius* and *Musgrave*. A. Pneumaticum, *Willis*. A. Humidum, *Baglivi*. Pituitous Catarrh, *Laennec*. — Char. *Gradual accession of the paroxysms, which increase in severity, are protracted, and attended with heavy and laborious constriction of the thorax, severe suffocative cough, and with expectoration, often commencing early, at first viscid and scanty, but becoming copious and affording relief.*

40. This common form of asthma may present various pathological states and relations. It may, as stated by Cullen and Good, be characterised by *plethora* of the vascular system generally, and of the pulmonary tissue especially, particularly when it supervenes to the suppression of some accustomed evacuation. It may also be associated with a relaxed or *atonic* state of the exhalants of the bronchial surface, particularly when it takes place after chronic catarrhs, and in aged or phlegmatic subjects; and it may be attended with both these states, namely, with plethora of the sanguineous system, and atony of the exhalant pores of the respiratory mucous surface. Besides these states, it may vary in respect of the acuteness and chronicity of its symptoms and progress; it being either *acute* or *chronic*, or presenting grades intermediate between both.

41. The chief characteristic of this variety of asthma is the copious discharge of viscid mucus accompanying it. But the questions with several modern pathologists have been, whether the phenomena of the disease are to be imputed solely to the accumulation of this fluid in the air-passages, or in part only; and whether spasm of those passages also exist in conjunction with an increased secretion of mucus, or not. I believe that an attentive observation of the phenomena of the disease, with the assistance of auscultation and percussion, — which, however, occasionally furnish but little information, and that of a negative description, in this disease, — will lead to the inference that it depends upon both those morbid states. The limits of our enquiry are now narrowed to the question of the priority of their existence, and the relation which the one holds to the other. As to these points it may be remarked, that the early occurrence of expectoration, as well as its abundance, forbid the inference that the production of viscid mucus is the consequence of relaxation of the spasm; whilst they favour the idea that the spasm is occasioned by this secretion in the irritable and morbid air-tubes; the severity and duration of the paroxysms being occasioned by these double states of disease, — an abundant secretion of viscid mucus in, and a spastic constriction of, the air-passages.

42. But it may be further enquired, are not those morbid changes the effect merely of a certain condition of the air-passages still more intimately connected with the disease than they are? I do not deny the possibility of lesions antecedent to those now specified; but the difficulty of ascertaining their exact nature must be conceded. It would certainly be advantageous to obtain this information, inasmuch as on it would be based the means of cure which might be employed early in the disease. That it is not inflammation is proved by concomitant and symptomatic phenomena, by the course of the paroxysms and of the disease, by the terminations usually characterising it, and by observation of the *juvantia* and *lædantia* during its progress. It seems, however, extremely probable that the morbidly increased secretion and spasm are preceded by a congestive state of the mucous respiratory surface; this state disposing to the spasm, and being, as well as the spasm itself, at last relieved by the copious effusion of mucus; the mucus first effused tending, however, for a time, to increase the spastic constriction of the air-passages, and the consequent struggle of the respiratory muscles to overcome it (§ 36, 37.), and to procure a fresh supply of air in the lungs. This antecedent state of vascular turgescence of the mucous surface of the bronchi in asthma, is perhaps most marked in that form of this variety, in which little or no expectoration accompanies the cough, at least early in the attack, and which, from this circumstance, and the causes which induce it, has been called the *dry* catarrhal asthma.

43. If it be still further asked, to what cause are we to impute this congestive state of the respiratory surfaces? I can only answer, to a certain primary change of the vital energy of the organic nerves supplying the blood-vessels, and actuating the muscular fibres of the bronchi; and hence, as the morbid changes of the circulation, secretion, and calibre of the air-passages, are merely effects of one cause, — of a previous change of the vital manifestations of the nerves of the organ, — it becomes of the utmost importance to ascertain the nature of this primary change with as much accuracy as possible, in order that remedial agents may be directed with precision to its removal; but the prosecution of this very interesting topic falls under another division of my subject. In estimating, however, the nature of this, as well as the other varieties of asthma, the difficulties opposed to expiration by the spasm of the air-tubes and the accumulation of viscid mucus in them, have been too generally overlooked in our eagerness to ascribe all the morbid phenomena to impeded inspiration. But I believe that the disease, particularly this variety of it, is as much occasioned by the obstacle these states of the air-passages present to free expiration; the air, by the greater power of the inspiratory over the expiratory muscles, being drawn in sufficient abundance into the lungs,

from which it is imperfectly expelled. From this circumstance the lungs are often kept in a state of inordinate dilatation, and the respiratory muscles excited to convulsive actions, occasioning dilatation or rupture of the air-cells, and consequent emphysema of the lungs. In the more advanced stages of the disease, in old and debilitated suhjects, this struggle to dilate the thorax still further, proceeding from the wants of the system for respiration, and to expel the air from the lungs through the obstacles placed in its way, generally terminates unfavourably to the latter part of the respiratory actions; consequently expectoration is impeded or suppressed, and life is terminated, with the air-tubes and cells, and even the substance of the lungs, loaded and infiltrated with mucus, air, and serum. It is in this state that active stimulants and emetics, by rousing the energies of the frame, and by exciting the expiratory efforts during the process of vomiting, prove so frequently beneficial.

44. This form of asthma may be partial, affecting one lung only, or one more than another; but it is more commonly general; and in some constitutions, particularly in aged persons, and when it has supervened to repeated attacks of catarrh, the quantity of viscid mucus expectorated is very great.

45. Its *anatomical characters* are, slight swelling, or thickening, and softening of, the mucous membrane, with a slight appearance of redness in parts, and with marked congestion, and purplish tint of portions of this surface in the more severe or protracted cases. Sometimes these lesions are accompanied with slight œdema of the membrane, and the developement of miliary tubercles in the lungs.

46. As the majority of cases of this disease is characterised from the commencement by copious expectoration, it becomes a question how far it deserves to be considered as a variety of asthma; but taking all its phenomena into consideration, particularly the spasm of the air-passages, and convulsive action of the respiratory muscles, as well as the circumstance of it having been usually considered as a species of asthma, and the difficulty of arranging it otherwise, I was unwilling either to assign it a different place, or to make it a distinct disease, to which it scarcely can lay claim. M. Laennec has placed it amongst catarrhal inflammatory affections of the bronchi: but I conceive that it is seldom inflammatory either in its origin or progress; and that, although occasionally commencing in, and always aggravated by, catarrh, it is not necessarily a catarrhal disease. Besides, inflammations of the bronchi and catarrhs are not identical affections, although the latter frequently pass into the former.

47. But, besides these considerations, many of the phenomena essentially characteristic of asthma always attend it to a greater or less extent. Upon an attentive examination, however, of the chest of a person afflicted with this affection, by auscultation and percussion, these phenomena are found to vary, in different cases, or even in the same case, at different periods of the attack; yet they are essentially the same as those which mark the preceding varieties, although not so evident to the senses as in them, inasmuch as they are obscured by a more prominent symptom — the copious mucous secretion and expectoration. Sometimes it is manifest that certain parts of the air-tubes are differently, or even oppositely, affected at different periods of the attack. When the viscid mucous secretion proceeds from, and is still present in, the smaller ramifications of the air-vessels, this condition, together with some degree of spastic constriction of their circular fibres, either in a part only, or more or less throughout the organ, occasions many of the symptoms which characterise the *second* or spasmodic variety of the disease. But in proportion as the secretion rises to the larger air-tubes, and leaves the smaller ramifications clear; or when the mucous secretion proceeds chiefly from the former parts, and excites, or is accompanied with, spasms of these canals, but not to the extent of preventing the passage of air into the parts of the lungs which they supply; these parts generally expand freely, owing to the vital activity of the organ, the wants of the system for the changes effected on the blood by respiration, and the active contraction of the inspiratory muscles during the convulsive efforts of the paroxysm. Hence the part of the lungs thus affected generally furnish the puerile respiration, and a clear sound on percussion, with a full and prompt performance of the inspiratory actions, — phenomena characteristic of the *first* or nervous form of asthma.

48. Diagnosis. — From the foregoing account of the symptoms and forms of asthma, it will appear obvious that the distinction of it from every other disease cannot be difficult, particularly if we carefully bring auscultation and percussion to our assistance. The sudden attack of the paroxysms, the short period of their duration, the violence of their symptoms, their returning after intervals of ease and of tolerable health, are sufficient to characterise the disease. It is only when asthma is complicated with, or has induced, other diseases — as chronic or acute bronchitis, pneumonia, tubercular phthisis, organic changes of the heart and large vessels, or effusions of fluid within the thorax — that difficulty can arise in determining the exact state of parts; and here we have it in our power to resort to auscultation and percussion, which, if this disease be simple and uncomplicated, will furnish us with no very unnatural sound, at least with none which will exist with any permanency in any particular part of the chest; and if it be complicated, the nature and the extent of the organic changes will be ascertained by these means, as pointed out under their respective heads.

49. *A. Spasmodic affections of the larynx* may be mistaken for asthma; but they may readily be distinguished from it by the sound occasioned by the passage of air through the narrowed passage, which is very different from the wheezing sound of the asthmatic respiration. Besides, in all the affections of the glottis, the patient readily points to it as the seat of his sufferings. The patient also betrays much more alarm of impending suffocation; whereas in asthma he is seldom apprehensive of the result, however severe the attack may be.

50. *B.* Severe cases of *acute bronchitis*, owing to the viscid and copious expectoration accumulated in the bronchi and trachea, and to the spasm excited in these parts and in the glottis during its expulsion, are often accompanied with fits of

difficult and spasmodic respiration, so severe as to approach nearly to the character of the asthmatic paroxysm. But the presence of inflammatory fever in bronchitis; and the copious, albuminous, thick, and glutinous expectoration; the absence of the distressing sense of stricture of the chest and dyspnœa which attend asthma; the gradual accession and increase of bronchitis; its continued character, and slow subsidence; and the varying appearance of the expectoration, with the different stages of the disease; will be sufficient to distinguish it from the humoral form of asthma, unless both affections are associated, or the one passes into the other, which sometimes occurs, as when bronchitis seizes the asthmatic subject.

51. *C. Angina pectoris* may also be mistaken for a severe fit of asthma. But the circumstances inducing an attack of both affections, and the periods of their accession, are different. Besides, the fit of angina pectoris is attended with a feeling of impending dissolution — a sensation which never accompanies the asthmatic paroxysm. The peculiar pains, also, under the sternum, and pain and numbness of the left shoulder, arm, &c. characterising the former, are not present in the latter affection. When asthma becomes associated with *disease of the heart* and *large vessels*, these sensations may accompany it, which will render the diagnosis more difficult. But still the accession of the asthmatic fit in the evening or night; the comparative immunity from it during the day, and in the open air; the history of the case; and the antecedent or attendant disturbance of the gastric functions; will still continue, and serve to point out the nature of the disease.

52. *D. Hydrothorax* is frequently attended with suffocating paroxysms of difficulty of breathing occurring during the night. But it may readily be distinguished from asthma by the scanty urine; by external œdema, particularly of the extremities; and the dead sound furnished by percussion, and the absence of the respiratory murmur. It must not, however, be forgotten, that hydrothorax is not infrequently consecutive of chronic asthma, particularly when the valves and cavities of the heart have become diseased in the course of the asthmatic attacks. — The affection denominated the *Acute Asthma of Infants*, by MILLER; *False Croup*, by GUERSENT; and the *Spasmodic Croup*, by WICHMANN, MICHAËLIS, DOUBLE, &c., is nearly allied to spasmodic asthma; one of the chief differences being its occurrence in infants. Its diagnosis, &c. will be found in the article on CROUP — *Spasmodic*. The practitioner should also be careful not to confound the disease with the difficulty of breathing which sometimes accompanies hysteria, hypochondriasis, and the passage of foreign bodies into the trachea.

53. PROGNOSIS. — There are few diseases which continue longer without shortening life; and which, therefore, admit of a more favourable prognosis in respect of a fatal result, or a more unfavourable opinion as regards a perfect recovery. It is chiefly from the consequences of a severe or protracted state of the disease that we are to apprehend any danger; and these are to be ascertained by auscultation and percussion, and our opinions formed accordingly. *a*. The circumstances which warrant a *favourable* prognosis as to *recovery* are, a recent attack, and its occurrence from a decided cause; the constitution of the patient being but little impaired; the absence of deformity and malformation of the chest; a free and easy state of the respiration, and a tolerably healthy condition of the various functions, during the intervals between the attacks. If the occupation of the patient be not injurious to the lungs; or, if so, can be readily relinquished; if the attacks are not extremely severe, nor of very long duration; and more particularly, if auscultation and percussion, as well as the rational symptoms, indicate an uncomplicated state of the disease, we have still greater reason to give a favourable opinion as to its issue.

54. *b*. On the other hand, an *unfavourable* idea must be entertained, especially as respects the perfect recovery of the patient, and his immunity from future attacks, if the fits be very severe; the cough difficult, suffocative, and attended with great expectoration mixed with blood and purulent mucus, — a state of the expectoration generally indicating rupture or dilatation of the small air-vessels, or the existence of tubercles in the lungs. If the occurrence of hæmorrhage from the lungs, of epistaxis, of hæmorrhoids, or of the menses in females, be not followed by a complete solution of the attack; — if the disorder be of long standing, and present remissions merely, or imperfect relief in the intervals, the attacks continuing for several days; — if the means of cure furnish but littlle or no relief; — if the patient be far advanced in life, and his constitution have suffered much either previously to, or from the malady; and if the body evince signs of cachexia; — if he has neglected his disease, or has been injudiciously treated; — and if the symptoms characterising any of the organic changes which I have stated to proceed from, or to be associated with, asthma (§ 20—24.), present themselves, particularly dropsical effusions in the pleura or pericardium, and the nature and extent of these changes are determined by means of auscultation and percussion, an unfavourable result must be looked for sooner or later; yet may this result be often deferred for a long period by judicious management. The exact degree or proximity of danger will depend entirely upon the nature and extent of the existing organic lesions, and the state of the vital energies of the frame.

55. If the expectoration become purulent, round, and globular; if hectic fever be present, with irregular or intermittent pulse; if palpitations occur, and alternate with leipothymia or syncope; if the urine be in small quantity and high coloured, the hands and ancles being œdematous; if the countenance continue bloated or livid during the imperfect intervals between the attacks; if the patient become restless, with slight wandering or low delirium; a fatal termination is not very far distant, unless under the most favourable circumstances of regimen and medical treatment, when life may be occasionally protracted for some time.

56. CAUSES. — 1st, *Predisposing causes*. Asthma is not a disease of early life, in its primary or idiopathic form. I have seldom or ever seen it before the 23d year of age. Some authors state that they have met with it in infancy and childhood; but I believe that they have confounded this affection with other diseases of the respiratory organs, and particularly with those to which young children are liable, and which has been termed spasmodic

croup, Millar's asthma, &c. by several modern writers, and its nature very generally misunderstood. The reader will find them treated under other articles. (See Larynx—*Spasm of; Croup—Spasmodic;* and Catarrh—*Suffocative.*) I believe that affections of the respiratory apparatus in children, which are not connected with inflammation, are generally symptomatic of disease of some other organ.

57. Asthma is evidently sometimes dependent upon hereditary disposition and conformation. It invades all temperaments, but especially the melancholic, the sanguineo-melancholic, the nervous and irritable. The male sex is much more disposed to it than the female, particularly those of the former sex who are of a full habit of body and advanced in life. Joseph Frank surely reckons the proportion of cases in males somewhat too high, when he states that six are affected to one female. So far, however, as my own experience enables me to judge, the proportion is not much less. Persons endowed naturally with great sensibility of the nervous system, or who have acquired this state from indulgence of the passions — from masturbation, venereal excesses, the immoderate use of warm bathing, long continued mental exertions, want of the requisite sleep, frequent excitement of temper, mental depression, and exhausting discharges, are much more disposed than others to be affected by the exciting causes of the disease.

58. The *spasmodic form* of asthma attacks most frequently persons of a spare habit, and who have been weakened or emaciated by the foregoing causes; or who have passed a laborious and anxious existence; whilst the *humoral variety* of the disease is commonly met with in those who are gross, phlegmatic, corpulent, robust, or full of blood, and who have been long exposed to the causes of chronic and general weakness, and have led an indolent, luxurious, or sensual life.

59. In addition to the foregoing causes, sanguineous plethora; malformation and injuries of the lungs, chest, or spine; peculiarities of formation of the air-passages, of the cavities of the heart, and large blood-vessels; constitutional irritability of the air-passages and lungs; narrowness of the glottis, and morbid sensibility and irritability of the nerves and muscles of the larynx; congestions, enlargements, habitual distensions, or organic changes, in the large viscera adjoining the diaphragm, as of the liver, stomach, spleen, and colon; previous disease of the lungs and air passages, particularly frequent attacks of catarrh, and neglected winter coughs; and adhesions of the pulmonary pleura to the costal or diaphragmatic pleura, may be ranked amongst the predisposing causes of the disease. It should not, however, be overlooked, that the foregoing do not only dispose the system, and particularly the lungs, to the operation of the exciting causes, but are also of themselves capable of producing the disease, when they act intensely, or when their operation is of long duration.

60. Neglected or confirmed *dyspepsia;* erratic or metastatic *gout;* suppressed eruptions, discharges, and habitual perspiration of the feet, are also predisposing and concurrent causes of the disease. In addition to these, I may add, the warmth and closeness of our apartments, luxurious habits, and previous diseases affecting the lungs in a particular manner — as whooping-cough, measles, small-pox, and typhoid fevers — as having a marked influence in predisposing to asthma.

61. 2d. The *occasional or exciting causes* are, various mental emotions and affections; paroxysms of anger, vexation, disappointment, anxiety, and all the violent or depressing passions; great fatigue; prolonged watchings; strong exertions of the voice, reading long aloud, or long speaking; terror, or surprise; sudden refrigeration of the surface of the body; or exposure to, and the respiring of a cold or hot, or a too moist or too dry air — these states of the atmosphere acting differently in different persons and varieties of the disease. Thus, the *third* and *first* varieties are generally relieved by a dry and pure air, whilst the *second* variety is occasioned or aggravated by it; and a very moist and cold air, or a humid, close, and warm air, whilst it frequently relieves the latter, always augments the former; but it is not infrequently observed, that states of the atmosphere which cannot be referred to grades either of temperature or humidity act very differently on different persons labouring under the disease, although the form may be the same. It seems to me extremely probable that this is owing, in a great degree, to the electrical states of the atmosphere, and the electro-motive condition of the frame; as we sometimes see the disease occasioned by close and oppressive states of the air, particularly when these states precede a thunder-storm, — thunder and lightning being less influential in its production than the electrical states of the atmosphere which terminate in these phenomena.

62. There are, perhaps, few causes which more frequently produce asthma, than those which act directly on the air-tubes through the medium of the respired air, as various kinds of dust and irritating particles floating in it (see article on Arts, *as productive of disease*); common coal smoke, the vapour from lime or brick-kilns, metallic fumes of every description, mephitic gases, every kind of acrid vapour, the fumes from chemical manipulations; hydrogen, nitrogen, carburetted hydrogen, carbonic acid gas, and all other gaseous productions floating in the atmosphere; employments which lead those prosecuting them to breathe an air charged with minute particles of vegetable, animal, or mineral productions, as manufacturers of cotton and wool, furriers, grinders, needle-pointers, &c. Odours of every description occasionally excite the disease, particular odours acting differently in different persons; those occasioning it in some, alleviating it in others — as the aroma of various flowers and plants, the smell of tobacco, ipecacuanha, &c.

63. The disease may also be produced, or rather a paroxysm may be occasioned in those subject to the disease, by whatever deranges the healthy function of the digestive organs, and particularly if it occasion acid or acrid eructations, which irritate the epiglottis and glottis, or cardialgia, flatulent or inordinate distension of the stomach or colon, or impedes the free descent of the diaphragm (*Ast. Stomachicum,* Baglivi; *Ast. Flatulentum,* Floyer, Schrœder, Baldinger), and by irritation and spasm of the glottis and trachea, (Willis, Lieutaud, Desgranges, &c.). It is also sometimes occasioned in the female by hys-

terical affections (*Ast. Hystericum*, Horstius, Baglivi, Sauvages, &c.); by misplaced, suppressed, or metastatic gout (*Ast. Arthriticum*, Musgrave, Hoffmann, Stoll, &c.); by the syphilitic poison; (*Ast. Venereum*, Juncker); by the slow introduction of lead into the system (Williams; *Ast. Metallicum* of Ettmuller and Ilsemann); by great obesity (Floyer); the suppression of accustomed discharges and evacuations, and from vascular plethora proceeding from this cause (*Ast. Plethoricum*, Dover, Cullen, Sauvages; *Ast. Sanguineum*, Hoffmann); by the repulsion of eruptions, the retrocession of exanthematous diseases, and the drying up of issues and eruptive discharges (*Ast. Exanthematicum*, Cullen, et Var. Auct.). It may also proceed from a cachectic habit of body (*Ast. Cachecticum*, Hoffmann, Sauvages, &c.); from excessive impregnation of the system with mercury (Schenk, Bonet); and from chronic catarrh and bronchitis (Laennec, Boisseau, &c.).

64. 3d, *Symptomatic Asthma.*—But little is required to be added under this head, further than to specify in a general way some of the organic lesions that sometimes excite phenomena, which either closely resemble, or are the same as, those which accompany the idiopathic disease. Amongst those, the disturbance of the pulmonary circulation, and the nervous and muscular irritation, occasioned by organic lesions of the heart and large vessels; by aneurismal tumours; by tumours affecting the diaphragmatic and pulmonic nerves (Béclard, Andral, and Parry); enlargement of the cavities of the heart, and obstacles to the circulation through the openings into the ventricles or arterial trunks; by ossific deposits in these situations, or in the coats of these vessels, or in the external surface of the heart, or pressing on the pulmonic plexus of nerves (Ferrus); by polypi in the cavities of the heart and large vessels (Diemerbröck, Floyer, Rostan); by adhesions of the pleura, and organic changes of the parietes of the chest, diaphragm, or spine; by curvatures of the spinal column, and lateral contraction of the chest, &c.; by hernia of the diaphragm (Hecker, Bonet); by tumours and effusions within the chest and pericardium; by organic changes in the vicinity of the larynx and trachea; by enlargement of the lymphatic glands within the chest and the glands of the bronchi; by tumours developed in the mediastinum (Schæffer); by foreign substances which have escaped into the trachea and bronchi; by organic changes of the lungs themselves, especially miliary tubercles, or similar productions in advanced stages of growth and change; by œdema of the lungs, or sero-sanguineous infiltration of their substance; and frequently by emphysema of the organ, and pituitous collections in the bronchi, the emphysema being a very common consequence and complication of the severer forms of the disease (Baillie, Laennec, &c.). Besides being sometimes induced by one, or more, of the above lesions, it may also be symptomatic of congestions and organic lesions of the liver and spleen; but, although those, and various other organic lesions enumerated under Dyspnœa, produce spasmodic and convulsive states of impeded respiration in some rare instances, yet they are more commonly productive of continued or remittent dyspnœa. Asthma is, moreover, sometimes symptomatic of lesions affecting the *medulla oblongata* and spinal chord, of *hypochondriasis*, and of diseases of the colon and rectum.

65. III. Complications of Asthma.—From the foregoing statement, it will be readily admitted that asthma very frequently presents itself in practice in complicated forms. Indeed, when the disease occurs in consequence of any of the states of the system described in § 60—64., or of any of the previously existing diseases and organic lesions of which I have stated it occasionally to be consecutive and symptomatic, it should be viewed as complicated with such lesion, and our attention directed to the whole of the morbid association, both pathologically and therapeutically. Our enquiries should likewise be extended even to the functions of distant organs, as it will occasionally have an intimate relation even with them, particularly to the functions of the digestive, assimilative, and generative organs. Amongst the most common complications of the disease, I may mention the various forms of *catarrh*, *dyspepsia*, *hypochondriasis*, *hysteria*, *emphysema*, and *œdema* of the lungs, *hæmoptysis*, *chronic bronchitis*, and *enlargement of the* cavities of the *heart*, as especially requiring our attention during the treatment. (See the articles Emphysema, Œdema of the Lungs, and Bronchitis.)

66. The paroxysm of the *third* variety of disease is often occasioned by a common catarrh; and owing to this circumstance, as well as the presence of many of the symptoms of this affection, it has often been denominated catarrhal asthma. It is sometimes also complicated with active congestion of the lungs, particularly of its mucous surface. Dr. Parry conceived that this state of the respiratory organs constitutes the disease; and instances the case of a person, who died in about twenty minutes with all the symptoms of spasmodic asthma, and in whom the only lesion was complete suffusion, of a damask rose colour, amounting in parts almost to blackness of the mucous membrane of the trachea and bronchi. Dyspepsia not only accompanies asthma, but very generally precedes an attack. The complication with bronchitis and hæmoptysis is chiefly observed in the third variety; whilst the association with hysteria and hypochondriasis is most commonly met with in the nervous and spasmodic forms of the disease.

67. *Organic diseases of the heart* and large vessels are very frequently complicated with asthma. The former seems to be most commonly a consequence of the latter; but, in some cases, an opposite order of causation obtains. In all such states of disease, either too little, or too much blood enters the lungs, and the healthy relation between respiration and the pulmonic circulation is changed: if either too much, or too little blood passes, it is imperfectly purified, and the wants of the system occasion a sense of anxiety and anhelation. But I believe that the phenomena of associated disease of the heart, and of the pulmonary functions, may be more correctly explained by referring them to the state of the nerves supplying the organs. These nerves are so intimately related, anatomically and physiologically, that disease originating in, or affecting, any one part of them, will frequently influence the functions of the whole, or of such of them as are most intimately connected with the originally

diseased part. When, therefore, we find a portion of the particular order of nerves, which supplies the respiratory and circulating organs, remarkably affected — whether such portion influence the state of the bronchi, or the circulation through the lungs, or the actions of the heart — can it be a matter of surprise that an analogous disorder should extend to parts so intimately related anatomically and functionally as are the air-passages, the pulmonic circulation, and the heart and large vessels?

68. Upon taking a review of the causes of this malady, we shall perceive that it may be occasioned, like several other chronic diseases of the respiratory organs, — 1st, By whatever lowers the vital energies of the frame, particularly as they are manifested in the lungs, and increases the susceptibility of the organ to the impression of external agents, or to internal morbid associations (§ 57.); — 2d, By mental or moral states deranging the nervous influence actuating the respiratory and circulating organs (§ 61.); — 3d, By agents which disturb the equilibrium existing between the cutaneous and respiratory functions (§ 61.); — 4th, By causes acting, during respiration, directly on the seat of disease, either by depressing the vital and nervous influence of the organ, or by irritating its mucous surface, and thereby exciting its fibrous structure to undue contraction (§ 62.); — 5th, By causes acting during respiration, especially aërial vicissitudes and states which modify or impede the respiratory functions, and favour congestion of the pulmonary mucous surface, or of the substance of the lungs; — 6th, By whatever impedes the action of the respiratory muscles, or embarrasses the motions of the parietes of the chest (§ 63.); — 7th, By lesions of the circulating organs deranging the circulatory function of the lungs or heart (§ 64.); — 8th, By the extension of irritation from adjoining viscera or parts (§ 64.); — 9th, By the destruction of the equilibrium between absorption and excretion (§ 58.); — 10th, By the transference of morbid action from other parts of the frame (§ 63.); — 11th, By affections of the respiratory nerves and plexuses, either at their origins, or in any part of their distributions (§ 57. 64. 67.). Hence the propriety of dividing asthma not only into the *nervous, spasmodic,* and *humid* varieties, but also into *two divisions,* as respects its relations to its causes, and to other diseases; viz. into IDIOPATHIC and SYMPTOMATIC.

69. PROXIMATE CAUSE. — The majority of writers on this disease, from WILLIS down to the times of HOFFMANN and CULLEN, have referred it to spasm of the bronchial tubes; and the same opinion has been espoused by many contemporary authors, particularly LAENNEC, WILLIAMS, &c. ROSTAN and several French pathologists consider the disease as altogether symptomatic of organic changes seated chiefly in the heart and large vessels: but, although this may be conceded to be the case occasionally, I conceive that they substitute the effect for the cause; lesions of these organs necessarily supervening in the manner already explained (§ 67.), after repeated attacks. The doctrine, moreover, has been completely overturned by the post mortem examination of cases of the disease by CORVISART, FERRUS, GEORGET, LAENNEC, ANDRAL, DELENS, and BRICHETEAU, in which no such changes were found. BREE, PARRY, and BROUSSAIS ascribe asthma to inflammatory congestion and irritation of the mucous membrane lining the air-passages; and this doctrine is at present adopted by many British and continental pathologists. I do not mean to dispute the existence, to a certain extent, of irritative congestion of the respiratory mucous surface, particularly in the *third* variety into which I have divided the disease, but still I believe that it is a part only of the changes from the healthy state, which constitute this malady. M. GEORGET contends that it proceeds from irritation about the base of the brain, and particularly at the upper part of the medulla oblongata, and origin of the respiratory nerves, occasioning convulsive paroxysms of the inspiratory muscles. MM. ROCHE and SANSON (*Elémens de Pathologie, &c.* t. ii. p. 642.) ascribe it to irritation of the nerves supplying the respiratory surfaces, occasioning convulsive actions of the respiratory muscles; ZALLONY to suppressed influence of the pulmonary nerves, and imperfect change of the blood in the lungs; DUPUYTREN to an affection of the par vagum; and HORN, HENKE, and many others, entirely to spasm of the bronchi. That the disease, in a great measure, depends upon the morbid state of the nerves supplying the lungs and respiratory muscles, is evinced by the case which occurred to M. FERRUS, who found, on the dissection of a female who had been subject to spasmodic asthma, a considerable ossific deposit in the centre of the pulmonic plexus, and compressing part of its nerves. There can be no doubt that irritation of the nerves, or impeded or interrupted nervous influence, will produce spasm of those muscular parts which they supply, and interruption of those functions which are dependent on their healthy influence.

70. The proximate cause assigned to the disease by CULLEN, PARR, and other modern authors, differs but little from that contained in the writings of WILLIS, BAGLIVI, HOFFMANN, BOERHAAVE, SAUVAGES, and others of their predecessors, excepting that it is stated by them with greater precision. It seems to me so correct, in the majority of cases, as not to admit of dispute. Doubtless the researches of contemporary pathologists have tended to show that many cases closely resembling this disease, and which would have been imputed to the same pathological states as it by our predecessors, depend on other conditions of the respiratory organs, and those differing widely in their nature from each other; thus abridging the number of purely asthmatic cases, and consigning to different organic lesions many that present nearly similar functional derangements to those which are strictly asthmatic.

71. I therefore conclude, with many of my predecessors, some of them unmeritedly overlooked at the present day, that asthma depends on a preternatural or spasmodic constriction of the air-passages, accompanied in many cases, especially in the humoral or catarrhal variety, and particularly when it assumes what M. LAENNEC has called the dry catarrhal form, with turgescence of the vessels of the lungs, particularly those supplying their mucous surface, and an increased secretion of mucus: and I would add, that, in this form of the disease, the spasmodic constriction of the air-tubes, the turgescence of their mu-

cous lining, and the accumulation of mucus in them, present an obstacle, not only to inspiration, but also to expiration; the lungs being thereby often kept in a state of inordinate dilatation, and the respiratory muscles excited to convulsive efforts, occasioning, in some cases, dilatation of the air-cells, or their rupture, and consequent emphysema of the organ, with effusions into the air-tubes, and other consequences described in the article on *Organic Diseases of the* Lungs.

72. IV. Treatment.—The treatment of asthma is generally directed to the fulfilment of two *intentions;* viz. to shorten or alleviate the fit; and to prevent its return, and thus remove the disease. The means of cure may therefore be divided, 1st, Into those which are to be resorted to during the paroxysm, with the view of attaining the first intention; and, 2d, Such as may be employed during the interval, for the accomplishment of the second. I shall notice successively the measures which may be resorted to for the fulfilment of these ends, with as strict a reference to the forms and complications of the disease as my limits will permit.

73. 1st. *Treatment of the paroxysm.* — In treating the fit of asthma, the practitioner will take cognizance of certain particulars, which should materially influence the choice, the combination, and the extent of the means, which are to be put in operation. The duration of the paroxysm; the age, temperament, and habit of body of the patient; the period he has been subject to the disease, the frequency of the attacks, and the particular form they assume; the state of health in the interval; and the presence or absence of concomitant, functional, or organic lesions of the lungs, heart, and digestive organs, are all of the utmost importance to be known; and, without tolerably accurate ideas respecting them be entertained, the disease cannot be judiciously treated. As individual cases vary greatly as to each of these circumstances, it would be impossible to describe in connection all the measures which may be employed in a paroxysm of asthma, so as to be appropriate to each of its numerous states and complications. Such descriptions, although they would be sometimes perfectly suited to a case, would as often be inappropriate, or even altogether inapplicable. I shall, therefore, detail separately the means of cure which have been found most beneficial, and point out the states and circumstances of the disease to which each of them seems best suited, at the same time arranging them in such a manner as to fulfil intentions of cure, based on the pathology of the disease.

74. *A. To remove congestion or repletion, when present.* — There are various symptoms which frequently present themselves during the asthmatic paroxysm, which would suggest the propriety of blood-letting. But it is often either of little service or positively prejudicial, especially in the first two varieties of the disease. In the third variety, however; and in the young, robust, middle-aged, and plethoric subject; or when the paroxysms are very severe, and are attended with signs of much congestion of the lungs and brain, as lividity and fulness of the countenance, stupor, extreme dyspnœa, &c.; blood-letting is indispensable, and should be performed either from the feet, or by cupping between the shoulders. Yet, even in these cases, bleeding will seldom do more than relieve the more urgent symptoms: it will seldom or ever put a stop to the paroxysm, and it should be practised always with much caution.

75. *B. To moderate or relieve spasm by antispasmodics, anodynes, and narcotics &c.*—These medicines may be viewed in connection, as a combination of them are more suited to the asthmatic fit, than the exhibition of them singly. They are beneficial chiefly in the first and second varieties of the disease, and in the third, when attended with severe convulsive and spasmodic fits of cough. When the disease occurs in hysterical females, or is associated with organic change of the heart or large vessels, these medicines are generally of much service. In the humoral form of the disease, and particularly when it commences, or is complicated with catarrh, they are less serviceable, although sometimes beneficial when judiciously employed. The particular remedies belonging to the above classes, which have received the approbation of the best authors, are *camphor, assafœtida, valerian, castor, musk, ammonia, æthers, coffee, opium, stramonium, tobacco, belladonna, hyosciamus, conium, prussic acid, colchicum, digitalis, lactuca virosa,* &c. &c., in various forms, and modes of combination.

76. *a. Camphor* is one of the most generally beneficial of any of this class of remedies, and is, when judiciously exhibited, applicable to nearly all the forms and complications of the disease. In the nervous and spastic varieties it is most serviceable when given in large doses (from three to ten grains), and combined with musk, castor, assafœtida, and the preparations of æther, opium, or hyoscyamus (see F. 25. 186. 423. 493.), and the following: —

No. 34. ℞ Camphoræ rasæ, gr. iij.—vi.; Ammon. Carbon. gr. iij.; Pulv. Ipecacuanhæ gr. j.; Extr. Hyosciami gr. iij.—v.; Mucilag. Acaciæ q. s. M. Fiant Pilulæ iij. statim sumendæ cum Haustu sequente, et horas post binas repetendæ, si sit opus.

No. 35. ℞ Magnes. Subcarb. ℈ j.; Aq. Anethi ʒ x.; Spirit. Æther. Sulph. Comp. ʒ j.; Tinct. Castorei ʒ j.; Olei Anisi ♏ iv. M. Fiat Haustus.

77. In the pituitous or catarrhal form of the disease, or in cases where blood-letting may be practised, and where we suspect active congestion of the mucous surface of the air-tubes, camphor is best exhibited in moderate doses, and combined with nitrate of potash, ipecacuanha, kermes mineral, James's powder, and other antimonials (see F. 494—496.).

No. 36. ℞ Pulv. Jacobi Veri gr. iij.—vj.; Camphoræ rasæ gr. ij.—iv.; Pulv. Ipecacuanhæ gr. j.; Ext. Hyosciami gr. iij.—vj.; Syrup. Papaveris q. s. M. Fiant Pilulæ iv., quarum capiat binas statim, et alteras post horam, vel omnes horâ decubitûs.

No. 37. ℞ Camphoræ rasæ gr. j.—iij.; Antimonii Tartariz. gr. ss.; Potassæ Nitratis gr. v.—viij.; Moschi gr. ij.; Extr. Opii gr. ij.—iv. (vel Ext. Lactucæ gr. iij.—v.); Olei Anisi q. s. ut fiant Pilulæ iv., quarum capiat binas statim, et alteras post horam, vel sumat omnes horâ somni.

78. *b. Assafœtida, castor, musk, valerian, myrrh, ammonia,* the *balsams,* the *oxide of bismuth,* the preparations of *zinc,* and the *æthers,* may be severally exhibited in the same states of the disease. They are more beneficial in the nervous and spasmodic varieties, when unassociated with inflammatory irritation, particularly in chronic cases, in the debilitated or aged; and in the third variety, occurring in persons of a relaxed and leucophlegmatic habit of body, — a conclusion which is conformable to the experience

of Millar, Renard, Schlegel, Wolff, Dover, Reidlin, Bang, Schmidtmann, Wichmann, Lentin, Kretschmar, Loebel, Hufeland, and Bernhard, and which will be justified by future observation, notwithstanding the doubts of their efficacy which have been entertained by some writers, who consider asthma as merely a form of inflammation of the mucous surface of the air-passages. They may be conjoined with one another, or with narcotics; and may be advantageously administered, particularly assafœtida and valerian, in the form of clyster.

79. Although these antispasmodics are indicated chiefly in the forms of the disease above alluded to, they need not be restricted to them entirely. When combined judiciously, as either with *antimonials*, or with *colchicum*, *opium*, *digitalis*, *nitrate of potash*, *camphor*, *ipecacuanha*, *hyosciamus*, *conium*, &c., and given in suitable doses, according to the peculiarities of the case, they will be productive of much benefit, in other states of asthma, both in the paroxysm and in the intervals. The external application of them, especially of camphor, assafœtida, galbanum, ammoniacum, &c., in the form of plaster, and particularly in conjunction with opium or with belladonna, will sometimes prove of much service. (See F. 112, 113.)

No. 38. ℞ Extr. Opii, Camphoræ, āā ℈ ij.; Emplast. Galbani Comp. ʒ iijss.—℥ ss. Fiat Emplastrum secundum artem, scuto pectori admovendum.

80. *c.* Besides the beneficial effects produced by it as an emetic, *ipecacuanha* is, when used with this or other intentions, one of the best medicines that can be resorted to in asthma, as being suited to all the states of the disease, particularly when judiciously combined with other substances. It may be associated with nitre, or colchicum, or digitalis, or with antimony, camphor, and narcotics, in the more febrile and catarrhal states of the disease (see F. 39. 394.); and with assafœtida, or with castor, benzoin, the spirits or oil of aniseed, valerian, opium, &c. in the more nervous or spasmodic varieties. (See F. 857. 900.)

81. *d.* The distilled *laurel water*, or the *prussic acid*, particularly the latter, is often productive of much benefit in the paroxysm. I have found it of great advantage when given in from two to four drops at the accession of the paroxysm, and in small doses in the intervals, particularly when the disease is attended with much irritability of the stomach and flatulence. It may be conjoined with camphor, ipecacuanha, æther, &c., or, indeed, with any of the medicines already mentioned. (See F. 344.)

82. *e.* Of the *narcotics*, *opium*, *hyosciamus*, *conium*, *stramonium*, and *belladonna*, are the most commonly used. The best preparation of opium in this malady is the compound tincture (see F. 729.); and it is most advantageously combined with camphor, aniseed, any of the æthers, or the wine of antimony or of ipecacuanha, according to the circumstances of the case. I have tried the *acetate of morphine* in this disease, as a substitute for opium, but with no benefit, unless when combined with stimulating antispasmodics; in which form, either the *sulphate* or the *muriate* of *morphine* may occasionally be employed. *Hyosciamus* and *conium* are often uncertain remedies; but when their preparations are genuine, they are very useful adjuvants, particularly the former; and, if judiciously prescribed, applicable to every state of the disease. The combination of *hyosciamus* with the *infusion of valerian* has been much praised by Loebel in the spasmodic form of asthma.

83. *f. Belladonna* has been found serviceable when combined with stimulating antispasmodics, particularly camphor, valerian, or assafœtida; but it requires caution. In conjunction with ammonia, galbanum, or assafœtida, &c. in the form of plaster (§ 79.), it will sometimes be productive of much benefit. The *lactuca virosa* will be also employed with advantage, under similar circumstances to those in which the above narcotics are beneficial. Schlesinger and Wolff advise two or three grains of its extract to be given, either alone, or with half a grain of digitalis, every two hours.

84. It may be observed generally, that narcotics can seldom be productive of any effect under a certain space of time, which will vary with the susceptibility of the patient. In many cases they will have no marked influence under two, or even three or four hours, at which time the severity of the fit will often subside without medicine. When given by the stomach, therefore, this circumstance should be kept in recollection; and should induce the practitioner to ascertain the period of accession or aggravation of the paroxysm, and to regulate the periods at which these, as well as other remedies, are to be exhibited, in such a manner as that their anticipated action may be contemporaneous with the commencement of the fit. As the attack consists generally of a series of paroxysms or exacerbations, medicines should be continued in suitable doses, and with reference to this circumstance, until it terminates. It will be found always advantageous to prescribe a full dose of the narcotic at once, in order that its effects may be secured as soon as possible. When any one or more of the stimulating antispasmodics, particularly camphor, ammonia, or musk, are combined with narcotics, a very large dose of the latter may be exhibited. Narcotics are most quick in their operation, when their vapour or smoke is inhaled into the lungs. Their effects are longest delayed when they are applied to the external surface; unless the cuticle has been previously removed, as in the "*endermic*" method of medication. The inhalation of the vapour of certain of this class of remedies, either alone or in conjunction with some volatile vapours, is one of the most certain and quick modes of obtaining relief in the asthmatic paroxysm.

85. *g. Stramonium* is one of the best remedies that can be prescribed in the spasmodic form of asthma. It is principally used by smoking it as tobacco. During this process, the patient may either draw a portion of the smoke into the lungs, or swallow some of it, or the saliva which has become impregnated with it. Stramonium is very advantageously smoked along with *aniseed*, or with a small portion of *tobacco*. It may also be employed internally during the asthmatic paroxysm, as follows: —

No. 39. ℞ Pulv. Fol. Stramonii gr. j.—iij.; Sodæ Sub-carbon. exsic. gr. vj.; Olei Anisi q. s. ut fiant Pilulæ ij. statim sumendæ.

No. 40. ℞ Succi Inspissati Stramonii gr. ss.—gr. j.; Potassæ Sub-carb. gr. vij.; Olei Cajeputi q. s. M. Fiant Pilulæ ij. pro dose sumendæ.

86. The smoking of *tobacco* is one of the most generally employed and efficacious remedies we possess for this disease; but it is productive of marked benefit only when it excites a free expectoration. The tobacco may be used in this manner along with *aniseed*, or with *stramonium*, or *both*. The internal use of preparations of tobacco, as of its infusion, tincture, wine, &c., so as to excite nausea, has also been recommended in the paroxysms of asthma by Ettmuller, Michaelis, and several German writers.

87. *h. Lobelia inflata*, or Indian tobacco, has been much employed in America in asthmatic cases. It is nearly allied in its operation to stramonium and tobacco; and often succeeds in checking the paroxysm, when given at its invasion, or very shortly before. It sometimes, however, fails of having any good effect, unless it be taken to the extent of producing nausea and vomiting. From six to fifteen or twenty grains of its powder may be prescribed for a dose, or from half a drachm to two drachms of a saturated tincture of its leaves (℥j. to O ss.).

88. *i. Inhalation of emollient and medicated vapours, gases,* &c. — Next and, perhaps, equal to smoking is the inhalation of simply emollient, or of medicated vapours into the lungs. This method of treatment was recommended by Cælius Aurelianus, Alberti, Mudge, Beddoes, Thilenius, Zallony, Hufeland, Crichton, Forbes, Gannal, Scudamore, and Murray. It is chiefly indicated during the paroxysm, or shortly before its accession. The vapours arising from pouring boiling water upon camphor, any one of the narcotic extracts or tinctures, or the balsams, are of great advantage when properly managed. Thus the vapour from a pint of boiling water poured upon half an ounce of balsam of tolu; or that from a solution of camphor, balsam of tolu, and extract of lettuce, or of conium, in sulphuric æther; or the fumes proceeding from camphor, hyosciamus, and aromatic vinegar, mixed together, and quickened by the addition of some boiling water, may be employed. A solution of balsam of tolu in sulphuric æther, the vapour of boiling tar diffused in the air of the patient's chamber, chlorine gas much dilated with common air, and various other medicated vapours, may be tried; but these act chiefly by removing the viscid phlegm which collects in the bronchi, and by exciting the extreme exhaling vessels. I have prescribed the vapour of the *sulphuret of iodine* in two cases: in one of spasmodic asthma, with no benefit; and in one of humoral asthma, with only temporary advantage. Sir C. Scudamore recommends this formula for the inhalation of iodine — (℞ Iodinæ gr. viij.; Potassæ Hydriodatis gr. v.; Alcoholis ℥ss.; Aquæ Destil. ℥vss. M. Fiat Mistura). To this he adds tincture of conium. But his directions as to quantity and mode of inhalation are, notwithstanding several attempts to unravel them, perfectly beyond my powers. I believe, however, that portions only of the above mixture should be employed for each inhalation. But the observing practitioner will generally be able to apportion the quantity, as well as to direct the particular materials, for inhalation, according to the peculiarities of the case; bearing in recollection that the combination of narcotic and anodyne vapours with volatile fumes and gases will generally be of more service in asthma than the use of individual substances belonging to one only of these classes of medicines; and that the more irritating substances of this description, such as iodine, chlorine, and tar vapour, should be ventured upon only in a very weak or dilute state.

89. *C. To remove viscid phlegm, and to prevent its formation.* — *a. By expectorants, &c. Squills* are amongst the most frequently prescribed medicines for this purpose, in asthmatic attacks; but they are certainly not applicable to all its states, although they, as well as *ammoniacum, inula Helenium,* and *senega*, are very generally recommended by some of the best medical writers. The good effects of these medicines in certain manifestations of asthma cannot be doubted; but I have seen them productive of much mischief in several cases in which they had been employed. It should be kept in recollection, that they are amongst the most active excitants of the respiratory mucous surfaces we possess, and are extremely apt to change active congestion of the bronchial lining into inflammatory action, especially in young, plethoric, or robust subjects; and, by their effect upon the expectoration — particularly by increasing it, rendering it thinner, less viscid, and more readily expectorated — to occasion a deceptive appearance of benefit, even when they are increasing morbid action, with all its ill effects. In relaxed and leucophlegmatic habits, however, or when the expectoration is viscid, and excreted with difficulty; the skin cool, soft, and moist; the pulse soft, slow, or weak, and the urine scanty; these medicines may be given with great benefit (see F. 66, 67. 74. 350.): but when the pulse is either hard, quick, or full; or the expectoration at all puriform; they cannot be exhibited without risk. They will often, doubtless, even in cases of active congestion of the respiratory mucous surfaces, afford real benefit, by exciting the capillaries to secretion, and thereby unloading them; but they may as readily kindle up inflammatory action. When combined, however, with antimonials, refrigerants, diuretics, or anodynes, the risk of mischief from them in doubtful cases is much reduced. Alberti, Floyer, Wagner, Schulze, Lentin, and Bree advise squills in the pituitous form of the disease, and found them most serviceable when they produced nausea or vomiting, — the benefit being, perhaps, more to be attributed to this operation, than to the medicine which occasioned it. Under the circumstances in which I have admitted the use of ammoniacum, squills, inula Helenium, benzoin, and senega, — namely, in the chronic pituitous asthma, — the Formulæ in the Appendix above referred to, or the subjoined, may be prescribed: —

No. 41. ℞ Scillæ exsic. gr. xij.; Myrrhæ ℈ij.; Extr. Hyosciami ʒss.; Olei Anisi q. s. M. Fiant Pilulæ xviij., e quibus sumantur binæ quartis vel sextis horis.

No. 42. ℞ Scillæ Pulv. gr. vj.; Pulv. Ipecacuanhæ gr. vj.; Camphoræ rasæ gr. xv.—℈j.; Pulv. Antimonialis gr. xij.; Extr. Hyosciami ʒss.; Syrup. Tolutan. q. s. Fiat massa æqualis, et divide in Pilulas xviij., quarum capiat binas tertiis vel quartis horis ex cyatho decocti Althææ.

No. 43. ℞ Tinct. Scillæ ♏xij.—℈j.; Acidi Nitrici dil. ♏viij.—♏xxiv.; Aquæ Pulegii ℥jss.; Spirit. Æther. Nit. ʒss.—j.; Spirit. Pulegii ʒj.; Extr. Hyoscyami (vel Conii) gr. iij; Syrup. Tolutan. ʒj. M. Fiat Haustus tertiis vel quartis horis capiendus.

No. 44. ℞ Mist. Ammoniaci ℥ivss.; Liq. Antimonii Tart. ʒiv.; Tinct. Camphoræ Comp. ℥ss.; Syrup. Tolutan. ℥j. M. Capiat cochleare unum pro re nata.

No. 45. ℞ Mist. Ammoniaci, Aquæ Destil. Lauro-Cerasi, āā ℥ijss.; Tinct. Castorei ʒiij.; Tinct. Opii Co. (F. 729.) ʒss.; Syr. Tolutan. ℥j. Fiat Mist., cujus sumat cochleare unum amplum subinde.

No. 46. ℞ Balsam. Tolutan. ʒjss.—ij.; Mucilag. Acaciæ ℥j.; tere benè et adde, miscendo, Tinct. Benzoini Comp., Tinct. Opii Camphoratæ Prist., āā ʒiij.; Olei Anisi ♏xx.; Aquæ Pulegii et Aq. Anethi āā ℥iij.; Syrup. Simp. ʒij. M. Capiat coch. ampla duo quater in die.

90. *b. Emetics* are amongst the most promptly beneficial remedies that can be resorted to during the paroxysm, with the intention of removing both phlegm and spasm; and they have been justly recognised as such by Cælius Aurelianus, Horstius, Mayerne, Floyer, Akenside, Bang, Kerbs, Hufeland, Wedel, Stoll, Bree, Loeffler, and Schmidtmann. *Ipecacuan* is, upon the whole, the best medicine that can be employed to produce this effect. The philosophical Akenside recommended a scruple of it to be given at the commencement of the paroxysm, and five grains every morning during the intervals, for some time, so as to occasion nausea. When the paroxysm is excited by an overloaded or deranged state of the stomach, emetics are particularly indicated. It is in such cases that Schmidtmann, one of the most practical and experienced of modern writers, recommends them; whilst Stoll and Loeffler advise them principally in the humoral form of the disease. In the asthma to which several classes of artisans, particularly pearl-turners, &c. (see Arts, and *the Causes of Disease,*) are liable, emetics have been found the most successful remedy in the paroxysm. But, besides this operation, ipecacuanha has an especially beneficial effect in asthma, as I have already particularly noticed. Next to it, and even superior to it in the very humid states of the disease, are the preparations of zinc, particularly the sulphate, in suitable doses and forms of combination (see F. 582—587.).

91. *c.* Nearly allied to emetics are *nauseants* and *diaphoretics.* These are sometimes of service, either at the commencement, or shortly before the fit. The substances that may be employed to produce this effect are ipecacuanha, and the different preparations of antimony, particularly the tartar emetic and kermes. These latter are praised by Bang, Vicat, and Hufeland. Ipecacuanha, in from one to five grains, or the antimonials in full doses, may be combined with nitre, camphor, opium, or hyoscyamus, according to the circumstances of the case (see F. 393. 854.).

92. *d. Refrigerants.* Of this class of medicines the most useful is the *nitrate of potash*, in conjunction with camphor, ipecacuanha, and hyosciamus (F. 279. 431. 436.), particularly in the humoral variety of the disease; in the state described as requiring blood-letting; or when the attack has been induced by, or is complicated with, catarrh. Either of the following draughts may be taken at the commencement of the paroxysm, and repeated in two hours, if necessary: —

No. 47. ℞ Potassæ Nitratis gr. x.—xx.; Spirit. Æther. Nit. ʒj.; Vini Ipecacuanhæ ʒj.; Tinct. Hyosciami ʒj.; Mist. Camphoræ ℥j.; Syrup. Tolutan. ʒj. M. Fiat Haustus statim sumendus.

No. 48. ℞ Potassæ Nitratis gr. x.—xvj.; Vini Ipecacuanhæ, Tinct. Hyosciami, āā ʒj.; Liquor. Ammon. Acetat. ʒiij.; Mist. Camphoræ ʒvj; Syr. Tolutan. ʒj. M. Fiat Haustus statim capiendus.

93. Besides the internal use of refrigerants, Loeffler recommends cold epithems to be placed on the chest, in the spasmodic form of the disease: and several Continental writers advise clysters of cold water to be administered when asthma seems to be connected with hysteria. In such cases, clysters of assafœtida or of infusion of valerian are preferable. Refrigerants act both by diminishing inordinate secretion, and by allaying spasm; and, when the disease is connected with active congestion, or excitement, are, with depletion, the safest measures that can be employed to remove, or to prevent the formation of phlegm.

94. *D. To transfer irritation to other parts,* or to recall the disease to its original seat, when it has arisen from the metastasis of gout, rheumatism, or the suppression of discharges, is often an important indication. The usual means of *revulsion* and *derivation*, or counter-irritation, particularly those which produce this effect with the greatest celerity, as *sinapisms, stimulating pediluvia,* and the *vapour bath*, are the chief revulsants that are admissible under such circumstances and at this period. They may be accompanied with diaphoretics, aperients, diuretics, or even emmenagogues, in particular cases. They have also occasionally been found successful in preventing the accession of the fit; particularly if employed when the premonitory signs first appear; and if internal derivatives, especially a purgative combined with antispasmodics and carminatives, have preceded them, and if they have been followed by gentle diaphoretics.

95. *E. To remove flatulence, by means of gentle aperients combined with carminatives,* is often necessary during the course of the paroxysm. I have observed much benefit derived from the exhibition of a purgative, combined with antispasmodics and carminatives, shortly before the expected accession of the attack, particularly when the premonitory signs begin to appear, and the digestive organs evince disorder — such disorder often acting as the efficient cause of the seizure. (See F. 28. 181. 266. 379.) The combination of diuretics, also, with the medicines prescribed during the paroxysms, or of carminatives, in order to relieve the distressing flatulence with which they are very generally accompanied or preceded, will be often found of service.

96. *F.* Besides the means noticed above, there are several which have been recommended in the fit — some of them most deservedly, others in a very indiscriminating, and hence not a very beneficial manner. Of the former of these, *warm coffee* is the most important. This dietetic remedy was used by Floyer in this disease, and more recently by Thilenius, Percival, and Bree. It generally affords much relief when made sufficiently strong; and it seems to resemble the stimulating antispasmodics, particularly camphor, in its action. I have also observed the paroxysm checked by strong *green tea.*

97. My limits oblige me merely to enumerate the other medicines which may be resorted to in the paroxysms of asthma. The chief of these are, dry cupping between the shoulders, a weak solution of phosphorus in æther, the oxides of *bismuth* and *zinc*, *nux vomica*, &c. by several Continental writers; *galvanism*, as recommended by Dr. W. Philip; electricity, by M. Sigaud Lafond; the chenopodium ambrosioides, by Hufeland; the infusion or spirits of juniper, by Bekker; guaiacum, by Aaskow, particularly when the

attack occurs in the gouty or rheumatic diathesis; cajeput oil, in the spasmodic form of the disease, by Wickmann; the veratrum album, by Müller; the muriate of ammonia, by Martius; and the external application of garlic, by Portal.

98. 2d. *Treatment during the interval.* — Our chief object during the interval is to prevent the accession of the attack, by avoiding the remote causes, and removing the morbid state of the digestive and respiratory organs which dispose to it, and whatever disorder of function or of structure with which the disease may have become associated. We should, therefore, endeavour to form a correct opinion respecting the state of the bronchial mucous surface, the morbid associations of the affection, and the consecutive lesions which may have already supervened to it. The state of the digestive functions, of the alvine secretions and excretions, should receive the utmost attention; and the means which may be most appropriately used for their promotion, in particular cases, ought to be assiduously employed.

99. *A. Evacuations, &c.* — Under this head I will briefly consider blood-letting, emetics, purgatives, blisters, issues, and diaphoretics. *a. Bleeding* is seldom of service in the uncomplicated state of the disease. But when it is accompanied with vascular plethora, or pulmonary congestion; or when the attack seems to have been produced by the suppression of an accustomed discharge, whether sanguineous or of any other description; a moderate blood-letting, or cupping between the shoulders, will be of advantage.

100. *b. Emetics* during the intervals are only required when the disease is characterised by congestion of the mucous surface of the lungs, obstruction of the bronchi by a viscid secretion, or torpid and loaded state of the liver and biliary apparatus. When prescribed shortly before the expected fit, they often succeed in preventing its accession.

101. *c. Purgatives* are often necessary; but they may also be detrimental. Those substances which irritate the digestive mucous surface, without producing a full feculent evacuation, are always prejudicial. Purgatives also are hurtful when they are employed so frequently as to lower the vital energies, and carry off a portion of the chyle which should be absorbed into the circulation. On the other hand, stomachic aperients and purgatives exhibited in combination with tonics and antispasmodics, and to the extent merely of promoting the digestive, assimilating, secreting, and excreting functions, are particularly beneficial. Either of Formulæ 266. 450. to 456. 462., contained in the Appendix, or the following, may be prescribed: —

No. 49. ℞ Aloës Socot. gr. iv.; tere benè cum Gum. Mastich. gr. ij.; et adde Extr. Gentianæ Comp. et Mass. Pilul. Galban. Comp. āā gr. iij.; Olei Anisi q. s. Fiant Pilulæ iij. hora somni quotidiè sumendæ.

102. *d. Diaphoretics* in small doses, in conjunction with anodynes, deobstruents, or antispasmodics, are of service merely in as far as they may preserve a regular state of an important function, and prevent the determinations to internal organs which frequently follow any interruption to it. But profuse perspirations and *warm bathing* are more generally prejudicial than otherwise. Indeed, whatever relaxes the cutaneous surfaces beyond a certain degree has an injurious effect upon affections of the lungs which are not acutely inflammatory, and particularly in the pituitous chronic asthma. When the paroxysm is associated with the dry catarrh, diaphoretics may be carried further with advantage; and when combined with expectorants and antispasmodics (§ 91.), they are more generally applicable.

103. *B. Expectorants, alterants, attenuants,* and *deobstruents*, or substances supposed to have some one or more of these effects, have been very generally recommended in asthma. Several of these have little or no effect, and others may even be injurious. *a.* The *expectorants* most frequently employed are those already noticed; but I believe that they are seldom productive of much advantage, given in the interval. When the disease is complicated, as it not infrequently is, with dry catarrh, or irritation of the bronchial mucous surface, those substances which have the effect of soothing irritation, relaxing spasm, and softening the pulse, as James's powder, kermes, ipecacuanha, camphor, antimonial wine, are in fact the best expectorants; inasmuch as they tend more to render the bronchial secretion less tenacious, where it is glutinous and obstructing the bronchi, and to diminish its quantity when too copious, than those which are of a heating or stimulating kind.

104. *b.* Amongst those medicines which are considered as attenuants, deobstruents, and alterants, there are none which possess greater claims to consideration in this disease than the pure *alkalies* and their carbonates, or their combination with oils, and antispasmodic or narcotic substances. However the propriety of applying the above terms to certain medicines in this disease may be cavilled at, there cannot be the smallest doubt, in the minds of those who closely observe the operation of remedies, that certain substances produce effects, on the respiratory surfaces and on their secretions, that justify the use of these terms. The *alkalies* in various forms of combination, but particularly with *oils*, have been much praised by Wolff, Bache, Sarcone, Mascagni, and Laennec. Either in the pure state or in that of sub-carbonates, combined with the oils of *aniseed* or of *almonds*, with ipecacuanha, small doses of blue pill, and hyosciamus, the *fixed alkalies* are amongst the best remedies to which we can have recourse, particularly in the catarrhal or bronchial complications, and when the disease is connected, as it very often is, with irritability or other disorder of the digestive organs. I have experienced the greatest service, in practice, from the following, and from Formulæ No. 348. 457.

No. 50. ℞ Sodæ Sub-carbon. exsic. ℈ ij.; Pulv. Ipecacuanhæ gr. vj.; Pilul. Hydrarg. gr. vj.; Olei Anisi ♏ xij. vel q. s. ut fiant Pilulæ xviij., quarum sumantur binæ bis terve quotidiè.

No. 51. ℞ Potassæ Sub-carbon. ℈ ij.; Pilul. Hydrarg. gr. iv.; Extr. Hyosciami (vel Extr. Papaveris Albi) ℈ j.; Olei Amydal. Dulc. q. s. ut fiant Pilulæ xviij., quarum capiat binas ter quotidiè.

105. Under this head, I may make further mention of the balsams, combined with small doses of rhubarb, or with the addition of magnesia; of a combination of assafœtida, or myrrh, with galbanum, ipecacuanha, and soap, or the fixed alkalies (F. 503—510.); frictions with stimulating or antispasmodic liniments in the course of the spine (see the Liniments in the *Appendix*); the nitro-muriatic acid wash, in a tepid state, over the chest, night and morning, or either the one or other only; warm clothing, &c.

106. *C. Blisters, issues, and artificial eruptions* are often extremely beneficial, particularly when asthma has supervened to suppressed discharges, to exanthematous diseases, or in the gouty and rheumatic diathesis. A large blister, applied between the shoulders or on the chest, a smaller one kept open, and issues and setons, have been recommended by the majority of writers. Zacutus Lusitanus and Severinus advise the actual or potential cautery to the nape of the neck. The production of artificial eruptions over the chest by the tartar emetic ointment appears to me, from considerable experience of its effects for many years (see *Lond. Med. Repository*, vol. xvii. p. 302.), preferable to any other mode of counter-irritation in asthma, particularly when the use of the ointment is commenced during the interval.

107. *D. Tonics and astringents.*—*a.* The use of the preparations of *bark* during the intervals has the support of the best writers on the disease. Amongst these I may notice Floyer, Bang, Chapman, Heberden, Feldmann, Ranoë, Frank, Withers, Ryan, Bree, and Laennec. The states of the disease in which they recommend it, are, 1st, When the disease assumes a periodic type, or when it is connected with malaria; 2d, In the pituitous form of the disease, when the habit is relaxed and leucophlegmatic; and, 3d, When the stomach is much debilitated. There can be no doubt of the *preparations of bark* or the *sulphate of quinine* being indicated in such cases. Indeed, wherever the powers of the constitution require to be rallied, and where there exists no inflammatory irritation to contra-indicate it, bark and other tonics are frequently beneficial. In these cases, the *decoction* or the infusion may be given, with the liquor ammoniæ acetatis, and vini ipecacuanhæ, or with the subcarbonates of the alkalies.

108. *b.* I have derived great service from the *sulphate* and *oxide* of *zinc* in the humoral form of asthma, particularly under the circumstances now described. Either of these preparations may be combined with ipecacuanha, camphor, myrrh, hyoscyamus, conium, opium, &c., according to the peculiarities of the case. Where it is desirable to produce a nauseating or emetic operation during the fit, or in anticipation of it, the sulphate of zinc is the next best medicine to ipecacuenha that can be employed.

109. *c.* The preparations of *iron* have met with the approbation of Bree and Stanger, particularly the *sulphate.* It may be employed in similar cases to those for which bark and the sulphate of zinc are prescribed. I can only allude to the recommendation of the *mineral acids* with opium, by Floyer, &c.; of the *sulphate of barytes*, by Keck and Hufeland; of *arsenical fumes*, by the Arabian physicians, and Ettmuller; of *Fowler's solution*, by Alexander; of the *nitrate of silver*, by Zallony; and of a solution of *phosphorus in æther*, by several German writers. These very active medicines are admissible only in the most obstinate cases, particularly when occurring in relaxed or debilitated habits, and when other active tonics and antispasmodics are indicated. *Saint Ignatius's bean*, and the *extract of nux vomica*, have also been mentioned by Stein and Hahnemann. *Strychnine*, the active constituent of these substances, seems deserving of a fair trial in asthmatic cases.

110. *d. Sulphur*, and *its preparations*, have been advised by Diemerbroeck, Gasser, Martins, and Bang; and from a few opportunities which have presented themselves of trying them, I consider them, particularly the *balsamum sulphuris*, — a combination of sulphur with the oils of aniseed, &c. (see F. 21. and 22.),—and the *sulphurets of potash* and *soda*, as medicines of no mean efficacy in several states of the disease. The sulphur precipitatum or sublimatum, taken in the form of an electuary (see F. 82. and 89.), is one of the best aperients to which we can resort in cases of asthma or continued dyspnœa. It may be also taken as follows: —

No. 52. ℞ Sulphur. Præcip. ℥ ss.; Semin. Anisi contus. ʒ ijss.; Confect. Sennæ et Syr. Tolut. āā ʒ vj. M. Capiat coch. ij. minima pro dose.

111. There are various medicines which have been recommended in the paroxysm, which may also be occasionally employed in the interval, particularly shortly before the expected accession of attack, and upon the first intimation of its approach. Of these, the most important are the antispasmodics and narcotics already mentioned (§ 75.), with the smoking of tobacco, stramonium, and aniseed, and the inhalation of the vapours of narcotic substances, and certain gases (§ 85. 88.).

112. *Flatulence* is a very frequent attendant upon asthmatic cases, chiefly before the invasion of, and during, the attack. It seems connected with irritation of the digestive mucous surface, and deficient vital power. The relief of this symptom is often a matter of importance. For this purpose I have sometimes prescribed the following: —

No. 53. ℞ Olei Anisi ♏ viij.—xij.; Sodæ Sub-carbon. gr. xv.; Sacchari Albi, Magnesiæ Ustæ, āā ℈ j.; tere et adde Tinct. Castorei ʒ j.; Tinct. Sennæ ʒ ij.; Aquæ Menth. Virid. et Mist. Camphoræ āā ʒ v.; Syrup. Tolutan. ʒ ss. M. Fiat Haustus, 3tiis vel 4tis horis ad tertiam aut quartam vicem sumendus.

113. 3d. *Of the treatment of the various symptomatic and complicated states of the disease.*— But little is required from me on this subject, after the detailed account of the treatment now given. When the disease is associated with either of the usual forms of *catarrh*, diaphoretics, consisting chiefly of ipecacuanha, antimonials, &c., combined with narcotics or anodynes, are chiefly indicated; and, if inflammatory irritation seems to exist in the bronchial lining, local depletions, colchicum, or digitalis, counter-irritants and revulsants, gentle aperients, and the inhalation of the vapour of warm water, in which a little camphor has been thrown, may be added to the above.

114. In the frequent complications of inflammatory irritation of the *digestive mucous surface*, and disorder of the *biliary apparatus*, or of derangement of the functions of the heart, it will generally be advisable to commence the treatment with five grains of blue pill on alternate nights, for three or four times, and with an aperient draught on the following morning. By these the secretions will be excited, and the bowels evacuated. Afterwards the healthy state of action of the capillaries of the mucous surfaces generally will be promoted by exhibiting half a grain of blue pill, three or four times in the twenty-four hours, combined with two or three grains of the extract of hyosciamus, or of extract of hop; vegetable tonics, with the fixed alkalies, or

other stomachic medicines, being taken through the day. If we have reason to suspect the existence of organic change within the chest, particularly inflammatory congestion in the lungs, enlargement of the structure of the heart, &c., the insertion of issues, or keeping up an abundant eruption on the external surface of the chest by the tartar emetic ointment, should be added to the above means. This treatment ought, with occasional variation according to the circumstances of the case, to be perseveringly continued for weeks, or even months; and it will often succeed, even in the most unfavourable complications. The *oxide of bismuth*, combined with tonic or bitter extracts, will also be found of service in the gastric associations of the disease.

115. When the disease is associated with affection of the head, or curvature of the spinal column, setons, issues, or moxas in the nape of the neck, or in the course of the spine, may be tried. If it be attended with disease of the liver, external irritation, the nitro-muriatic acid bath or lotion, small doses of mercury, and the plaster, Form. 117., may be prescribed. Organic lesions of the heart and large vessels, and dropsical effusions, require a combination of these measures with the use of alkalies, digitalis, opiates, &c. When hysteria, and generally increased sensibility and susceptibility, attend the asthmatic affection, tonics with antispasmodics are principally indicated. In the other complications of asthma, the treatment recommended in DYSPNŒA will be generally appropriate.

116. 4th. *Of the regimenal treatment.* — Much advantage will be derived in asthma from strict attention to diet and regimen, — comprising bathing, exercise, air, and climate, the use of mineral waters, &c. *A. Cold sponging the surface of the chest, and cold bathing*, are amongst the most approved means that can be resorted to during the intervals of asthma. They tend both to diminish the sensibility and susceptibility of the patient to the impression of cold, — one of the most frequent exciting causes of the attack; and to give a salutary tone to the respiratory mucous surfaces and vessels ramified in them; and hence they prove the best means which can be resorted to for the prevention not only of the asthmatic attacks, but of catarrhs, and all other affections and diseases of the respiratory organs. The patient should commence this practice with the following lotion, with which the whole of the chest and upper part of the abdomen should be sponged, or rubbed with a towel or piece of flannel wetted with it, and afterwards be dried, using smart friction at the time : —

No. 54. ℞ Acidi Acetici Pyrolignei vel Vini Albi, Liq. Ammoniæ Acetatis, āā ℥ijss.; Aq. Rosarum ʒv.; Spirit. Vini Tenuioris ℥ij. M. Fiat Lotio.

This should be used every morning upon getting out of bed; and if the patient commence with it during the winter, a fire may be kept in the dressing-room, and the chill taken off it for the first few days of using it. Instead of the above lotion, a solution of common salt in water, in the proportion of two table spoonsful to a pint, or one part of vinegar to two of water, may be employed. After these have been continued for some time, or as long as the patient may please, and the system has been thus prepared for it, the shower bath may be substituted with advantage, particularly if the patient be in that state of health which will allow him to bear the shock without risk. Sea or salt water bathing may also be resorted to all the summer and autumn; and the shower bath, or at least cold sponging the surface of the trunk of the body, all the winter and spring; for it will generally be advisable not to discontinue this practice for any considerable time after it has been fully adopted and found of service. In addition to the cold bath, the patient should have recourse to regular exercise in the open air; and attend to the state of his digestive organs, and the regular functions of the bowels.

117. If along with the asthmatic affection the patient have complained of palpitations, irregularity of the action of the heart, œdema of the ancles, severe dyspeptic symptoms, and disorder of the liver or bowels, these ought to be removed, before commencing with cold sponging and bathing, by local depletions when they are indicated; by very small doses of blue pill, or the hydrargyrum cum creta, with the sub-carbonates of the fixed alkalies, and hyosciamus given at bed-time, a gentle aperient draught the following morning, and bitter tonics, with the alkalies through the day. The recommendation of cold bathing in asthma may startle some; but when all associated disorder of an inflammatory kind has been removed by appropriate treatment, and the means now specified, and when the system has been duly prepared for it, cold bathing is actually one of the most salutary measures, and the most permanently beneficial, that can be prescribed. It has, moreover, received the sanction of CÆLIUS AURELIANUS, FLOYER, WITHERS, MILLAR, RYAN, BREE, and HUFELAND, — names which should claim our respect for whatever they recommend, even if our own experience did not altogether confirm their opinions, which, however, is in accordance with theirs as to this practice.

118. *B. Mineral waters.* — The waters in this country, which are best suited to asthma, are those of Cheltenham and Leamington; and of Buxton and Bath, to some of its complications, particularly the arthritic. Dr. J. CLARK very justly remarks (*The Influence of Climate, &c.* 2d ed. Lond. 1830, p. 371. *et seq.*), that when asthma is accompanied with chronic irritation of the bronchial membrane, or with disorder of the digestive organs, and an unhealthy state of the skin, a course of warm mineral waters will often prove of benefit. The springs of Ems on the Rhine, of Carlsbad, of Bonnes and Cauterets in the Pyrenees, and of Mont d'Or in Auvergne, are those chiefly esteemed on the Continent. The great difficulty generally is, that the climate and degree of elevation of these places will often not suit particular asthmatic cases. Where the climate of a valley is likely to suit the patient, Ems and Carlsbad will be preferred; and where an elevated situation is required, the Pyrenees and Mont d'Or will be chosen. The artificial waters of Ems and Carlsbad, prepared at Brighton, are but little inferior to the natural springs. In a case of this disease, where I directed those of Ems, great benefit was obtained from them.

119. *C. Change of air and climate.* — It is impossible to point out the particular climate or locality which will best suit the asthmatic patient; for the state of air or climate which will suit one,

will distress another, and without any very evident cause to explain the different effect. In nearly all cases, however, changes of air are beneficial, chiefly as respects the general health of the patient, and the disorders with which asthma is associated. Upon the whole, a temperate, equable, and moderately moist state of the the air is best borne: but even in this, there is is much uncertainty. The physician must be guided in his choice by the kind of asthma with which the patient is afflicted, and by the ascertained effects of certain seasons and localities in his particular case. In general, a moist and warm, or mild climate, as the south-west extremity of this island, will suit the spasmodic or dry form of the disease, and that most commonly associated with the dry catarrh, much better than any other in this country; whilst the pituitous or humid variety, occurring in the debilitated or aged, and in those of a relaxed and leucophlegmatic habit, and attended with much expectoration, will require a dry and a somewhat bracing state of the air.

120. *D. Diet.* — Very little is required to be stated on this topic. The food should be always light, digestible, in small quantity, and chiefly farinaceous; particularly in those cases which indicate general or local plethora, inflammatory irritation, and disorder of the digestive organs. Floyer particularly insisted upon abstinence, as to both eating and drinking; and later writers, and experience, have confirmed the justice of his injunction. When the disease is accompanied with lowered energies of the powers of life generally, the diet should not be so poor as to furnish insufficient means whence the mischief may be repaired; but it ought, notwithstanding, to be light or digestible, and not exceeding the powers of the digestive organs to manage with facility.

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ATROPHY. — (From the privative α, and τροφὴ, nutrition, or τροφέω, I nourish.) Pathology — *Morbid Structure.* — Syn. *Atrophie, Consomption*, Fr. *Ungedeiben, Schwindsucht, Auszehrung*, Ger. *Voedeloosheit*, Dut. *Atrofia, Somma Magrezza*, Ital. *Wasting*, Eng.

1. Defin. *Deficient nutrition of a part or of the whole frame, owing to which its natural dimensions are necessarily reduced.*

2. The healthy proportions of the various parts of the frame are preserved by their vital endowment, and are intimately dependent upon the conditions of this influence. When it preserves its due relations throughout the frame, a continued vital attraction of molecules from the blood takes place, to an extent sufficient to supply the place of those particles, which, having lost their vital affinity, are removed by absorption. This slow process, by which animal particles are taken away, for a time, from the current of the circulation, assimilated in the various tissues, afterwards detached from them when they no longer are suited to the purposes of the structure, and carried back to the circulating current to be partly eliminated from the frame, and partly changed into different conditions, is not infrequently liable to be disturbed in some one of its parts or steps. Thus, when the vital influence of an organ, or of the whole frame, is in a state of activity, the attraction of molecules from the blood, similar to those constituting the different tissues, is energetic, and extended to a greater number of such molecules, — they are held in closer affinity, and the bulk of the part is increased. But when the state of the vital endowment is reversed, when it is weak or depressed, this attraction proceeds slowly and languidly, and, the existing affinity being also weak, the molecules composing the tissues are sooner removed by the process of absorption than in health, and the part thus circumstanced is wasted, from a more rapid loss of its molecules than can be supplied by the low state of vital affinity. Thus, as in the former case, a double condition of the organisation, but of opposite natures, actually obtains; namely, the attraction is extended to fewer molecules, and the affinity between them is more languidly exerted, they being more rapidly carried,

by the process of absorption, back into the blood, from whence they came, in order to be partly changed and partly eliminated from it; and the part thus affected, instead of retaining its healthy proportions, becomes wasted, deficient in its constituent molecules, or atrophied. Thus we perceive that there is a continued circulation of nutritious particles in the very tissues which they compose; that this circulation, and the affinity which preserves them in their spheres, is vital, influenced by, and fluctuating with, the various conditions of the vital endowment of the frame, the nutrition and bulk of a part being intimately dependent upon it.

3. Nutrition being, then, the result of a vital attraction exerted between the molecules of matter constituting the elementary tissues, and those which are similar to them in the blood, and being co-ordinate with the strength of that attraction, atrophy necessarily proceeds from a diminution of this affinity, and the more rapid transit, consequent upon this diminution, of the particles which have been attracted, back into the current of the circulation. The healthy proportion of the tissues is therefore continued by a due equilibrium being preserved between the attractive influence on the one hand, and the continuance of vital affinity on the other. When either the attraction is active, or its duration long, the bulk of the structures will be increased; but when the former is weak, or the latter of short continuance, atrophy will necessarily result.

4. The truth of these propositions is evident from a due consideration of the various phenomena of health and disease, and by the numerous contingent circumstances which influence the conditions of the different structures of the body. At this place I will briefly describe, *first*, the appearances which atrophied structures assume; *secondly*, the various causes and circumstances which, influenced by the vitality of the frame, produce this change; and, *thirdly*, the treatment that may be employed to remove it. Thus I will confine myself, at this place, entirely to the consideration of atrophy, in its *generic* acceptation; the *species* being treated of under distinct and separate heads.

5. *A. States or appearances of atrophied parts.*— Atrophy may be confined to particular structures; it may affect only a particular constituent tissue of an organ, whilst its associated tissues are hypertrophied, and it may extend to various contiguous structures or unconnected organs. A particular constituent tissue may, however, be wasted, and yet its associated structures may be augmented in bulk, as I have shown occasionally to occur, when describing the morbid states of the liver. When this takes place, either no diminution, or an actual increase of the whole organ, is observed. When a compound organ, or part formed of various elementary tissues, is atrophied in all its constituents, the diminution of volume is then very remarkable; although, in some cases, as when the atrophy consists chiefly of a rarefaction of the internal structure of an organ, as of the lungs and bones, the external surface presents little or no change.

6. The earliest and most essential change in an atrophied part is diminution of the quantity of blood sent to it; and next to this, and chiefly owing to it, is greater paleness of colour. Subsequently the organisation is still more completely changed; so much so, frequently, that all traces of its original conformation are lost, and the part is reduced to the state of cellular or fibro-cellular tissue, generally of small size. In some cases, the part is not only extremely atrophied, but at last disappears altogether. When membranous structures are atrophied, they become much thinner and more diaphanous than natural, or even perforated.

7. The atrophy of certain organs or parts is a natural or healthy change, as respects the fœtus in utero, and the newly-born infant. The parts which experience those changes are too well known to require notice. Several structures, especially muscular parts, sometimes have preternatural quantities of fat deposited on their surfaces during the progress of atrophy. This is often observed in respect of the heart, and appears to result from the same causes; namely, diminished vital energy, occasioning insufficient nutrition or assimilation (§ 2, 3.), and a morbid secretion of fat, which often is as much a consequence of diminished vital energy, as insufficient nutrition of the different structures is the result of this state; both changes being, in some cases, merely grades, in others modifications, of the same vital manifestation.

8. Various parts of the body naturally undergo marked atrophy during advanced age. Of these the most remarkable are the generative organs, particularly the ovaria, mammary glands, testes, the thyroid gland, the bulbs of the hair, adipose tissue, the lungs, and bones. Atrophy of these and other parts has received a more particular notice under their respective heads. I may, however, remark, respecting the atrophy which results from age, that it is very evidently the result of diminished vitality, especially as those parts which first experience a loss or diminution of their functions, either from age or exhaustion, are the first to be atrophied; and that it often differs from other forms of atrophy, in consisting merely of a deficiency of the fluid constituents of the structures — in a condensation and dying of the organs, and not of a loss of the molecules constituting their solid parts.

9. *B. The secondary causes which, under the influence of the vitality of frame, produce atrophy*, are, 1st, Original deficiency of developement, constituting *congenital atrophy*. This state of atrophy may exist in every grade, and may amount to a total absence of an organ or part. When it takes place to this extent, it has evidently arisen from an arrest of the formative process, or of the developement of the tissues, in consequence of disease of the embryo. If the disease affect the nervous centres, the parts supplied with nerves from them are sometimes either much atrophied or altogether wanting, as MM. Rostan and Serres have shown. But this is only an occasional occurrence; for parts of the brain or of the spinal chord have merely consisted of a serous sac, and yet the organs of sense and the limbs have been fully developed; and there have occurred many cases in which both brain and spinal chord have been entirely wanting, and yet the nerves proceeding from them, and the organs which the nerves supply, have been fully formed; evincing the truth of the doctrine stated by the writer many years since (see *London Med. Repos.* vol. xvii. for May, 1822;

and *Notes to* Richerand's *Elements of Physiology*, 1st ed. 1824.), that the nerves are first formed, and the cerebro-spinal centres subsequently developed.

10. 2d. A diminution of the influence of those nerves which preside over the circulation of a part, and its assimilative and proper functions, rapidly reduces its volume. It is chiefly owing to this cause that the organs of generation waste in old persons. The ganglia which supply these organs, in both sexes, become, in old age, small and indistinct; and the nerves which issue from them to these parts can scarcely be traced. I have no doubt that a similar result follows injury or change of the ganglia or ganglial nerves in other parts of the body. The paralysis attendant upon painters' colic is generally accompanied with great wasting. In cases of unreduced dislocation, when the head of the bone presses upon the nerves, wasting is a frequent consequence, chiefly owing to the incapability of exerting the voluntary muscles, which are rapidly atrophied when they remain inactive. Injuries of nerves, of whatever description, that interfere with their functions, will, as shown by Bell, Lobstein, and several others, occasion atrophy. But I may add, that whilst injuries of ganglial nerves will produce it directly, by arresting the nutritive actions, injuries of voluntary nerves occasion it indirectly only, and chiefly by depriving the muscles of their contractile powers, and reducing them to that state of inactivity which is more or less rapidly followed by atrophy. This is proved in the numerous instances which come before us of paralysis originating in the brain. The wasting of the paralysed limb in these cases is seldom great, and it is chiefly limited to the muscles; the other structures, particularly the cellular and adipose, being unaffected.

11. 3d. Diminished supply of blood is a very frequent cause of atrophy. This may be local, as in cases of obliteration of a large arterial trunk, and when the functions of an organ cease. In many such cases, however, the obliteration may be the consequence of injury of the ganglial nerves which supply the artery, or of the cessation of the functions of the part. The general state of atrophy which occurs after tubercular formations in the mesenteric glands, or in the lungs, is, generally, partly owing to the diminution of the entire mass of blood, together with lowered vital influence; the nutritious molecules, and the assimilating or attractive power being both deficient. A similar inference may also be extended to the wasting accompanying idiopathic anæmia.

12. 4th. When the functions of a part or organ are arrested, atrophy always results. This is remarkably the case in respect of the voluntary muscles (§ 10.). On the other hand, increased function of an organ contributes to augmented volume. The urinary and generative organs furnish well-known proofs of those positions, and illustrate those with which I commenced, namely, that nutrition, and consequently atrophy, most intimately depend upon the states of vital manifestation of an organ or part. Other organs incapacitated from acting also undergo a marked diminution of their size. Even the lungs, when the principal bronchial tube of one lobe is obstructed, will experience atrophy of that lobe, as MM. Reynaud and Andral have shown. In cases of death from hunger, the stomach and large bowels appear wasted.

13. 5th. Atrophy will also present itself as a conseqence of inflammation; and, in some cases, will amount to obliteration or disappearance of the part. Such changes are not infrequent in blood-vessels and excretory ducts. It is sometimes observed in the spleen, liver, and gall-bladder; the last of which has been observed to be wanting or entirely obliterated from this cause. In the majority of such cases, the atrophy has proceeded from obstruction to an artery or vein having occurred during the disease, probably from the extension of inflammation to them, or from the pressure of some of the usual products of the inflammatory state.

14. *C.* Treatment *of atrophy.* — In all these circumstances under which atrophy occurs, it will always be observed that the vital energies, in some one or other of its manifestations, are diminished or perverted — most frequently the former. This fact furnishes us with the most rational indication as to the removal of the morbid state which it occasions. Having first ascertained the circumstances and pathological states of the atrophied organ, we are to direct our attention to remove them as far as may be possible. We are next to endeavour to restore the natural vital energy of the organ by exciting its functions, and promoting the constitutional powers. Knowing that, by increasing the natural actions of a part, we thereby increase its nutrition and bulk, we should endeavour to apply this principle to the removal of atrophy, but with a cautious avoidance of fatigue or exhaustion being occasioned by the means we use for this purpose. When the atrophy seems to depend upon the developement of tubercles, or upon engorgements of lacteal glands or tumours pressing upon nerves or large vessels, the preparations of iodine are indicated, on account both of their influence in removing these tumours, and of their excellent tonic powers when judiciously administered. In many cases the functions of the digestive organs — stomach, liver, and bowels — are torpid, and consequently the nutritious fluids are not sufficiently prepared to be assimilated in the different tissues. Healthy chyle is not supplied in the requisite quantity, or, if supplied, is not converted into healthy blood for the nourishment of the structures. In these cases, although the energy of the whole frame is deficient, yet our principal means of medication are to be directed to these organs. (See art. Consumption, Marasmus, Mesenteric Disease, and Tabes Dorsalis.)

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AUSCULTATION. — (From *ausculto*, I listen). Pathology, *Semeiology*. — 1. This term is applied to the methods used to ascertain the seat and nature of disease, by the signs which may be recognised by the sense of hearing. It comprises the study of all sounds indicative of disease, whether heard by the unassisted ear, or through the medium of instruments; and whether arising naturally, or produced artificially. The observations I have to offer upon this mode of investi-

gating disease may be arranged in the following manner; but I shall confine myself at this place to the consideration of the *first* class of signs, and devote to the *second* class a distinct article. (See PERCUSSION.)

2. I. SIGNS FURNISHED BY SOUNDS PRODUCED NATURALLY WITHIN THE BODY.

A. Sounds having their seat in the chest. — *a.* Depending upon the passage of air during respiration. *b.* Proceeding from the action of the vocal organs. *c.* Depending upon the action of the heart.

B. Sounds having their origin in the arteries.

C. Sounds seated within the abdomen. — *a.* Proceeding from air in the digestive tube. *b.* Depending upon the fœtal circulation.

II. SIGNS FURNISHED BY SOUNDS PRODUCED ARTIFICIALLY. (See PERCUSSION.)

3. HIPPOCRATES remarked that the existence of fluids in the thoracic cavity might sometimes be ascertained by applying the ear for some time to the side of the chest; and our countryman HOOK (*Posthumous Works,* p. 39. &c.), in several very pointed observations, not only stated the importance of attending to the sounds produced by the " internal motions and actions of bodies," but also of rendering them sensible so as to distinguish between them; for the doing of both which, he thinks, " it is not impossible but that in many cases there may be helps found." M. DOUBLE, also, was in the habit of applying the ear closely to all parts of the chest, in order to examine the signs furnished by the action of the heart, and by respiration; and published his recommendation to cultivate this means of diagnosis, in his able work on Semeiology, two years before the appearance of M. LAENNEC's celebrated production. Although, therefore, M. LAENNEC may not have been the discoverer of the importance of auscultation in the investigation of disease, yet is he clearly entitled to the honour of discovering *mediate* auscultation — of inventing the stethoscope — and not only of bringing both these modes of examination into general use, but also of strongly recommending percussion, and of improving, in a very remarkable manner, our knowledge of the pathology of pectoral diseases.

4. It is unnecessary to occupy my limits with a description of the instrument termed the *stethoscope,* as its construction, with the improvements of M. PIORRY, and the acoustic principles on which it assists the sense of hearing, have been frequently described, and are so simple, as to be readily understood, even by those who are not already acquainted with it. I may remark at this place, that auscultation, like every other method of investigation, requires practice for its perfection. The young practitioner should therefore early commence the study of the sounds of respiration and of circulation, at first with the unaided ear upon the healthy subject, and preferably on children, from five to twelve years of age, as in them all these sounds are distinct, and seldom modified by organic disease. Having made himself familiar with these sounds, by frequent recourse to this practice, he may provide himself with the cylindrical stethoscope in general use, and with the one called PIORRY's; and, with their aid, continue his study of the sounds produced within the living body.

5. Having limited myself at this place to the consideration of the SIGNS FURNISHED BY SOUNDS PRODUCED NATURALLY WITHIN THE BODY, whether heard by the unassisted ear, or by the aid of the stethoscope, I proceed, *first,* to notice the *sounds having their seat in the chest and throat.* These sounds are chiefly produced by the natural movements of the parietes of this cavity, and of the organs contained within it, and consist of, 1st, those of respiration; 2d, those of the voice; and, 3d, those of the heart. These will be successively considered.

6. I. AUSCULTATION OF RESPIRATION. — *A. Of the healthy and simple respiratory sounds.* The passage of air into, and out of, the lungs occasions a somewhat different sound in various parts of the chest, owing to the difference of size of the tubes through which the air passes. Hence the respiratory sound has one character in the small bronchi and air-cells, another in the large bronchi, and another in the trachea. These sounds have been respectively denominated, by LAENNEC, ANDRAL, and WILLIAMS — the best writers on auscultation — vesicular, bronchial, and tracheal. The *tracheal* sound is heard in the anterior and lateral parts of the neck, the upper portion of the sternum, and the sternal part of the subclavian regions. The *bronchial* respiration is heard in the middle portion of the sternum, and parts of the mammary regions contiguous to it, and in the axillary and interscapular regions. *Vesicular* respiration is perceptible over the remaining parts of the chest in health. These sounds are double; the one being that of inspiration, the other of expiration. The former is much stronger than the latter, which is often scarcely to be heard by the unpractised ear, unless assisted by the stethoscope.

7. It is difficult to describe these sounds with accuracy. The vesicular sound is a dull and diffused murmur, or a feeble breathing, resembling that proceeding from the passage of the air through the nostrils in a healthy and quiet sleep. The bronchial respiration is more tubular and blowing, and is chiefly confined in health to the situation of the largest bronchi. The tracheal sound merely conveys the idea of air passing through a tube of larger calibre, and is more hollow and blowing.

8. The respiratory sounds vary in their intensity, not only in different persons, but also in the same person, at different epochs of life, and at various times. The thickness of the parietes of the chest does not materially diminish their intensity; but the activity of the respiratory function affects them most materially; this function presenting different grades of activity in different persons. Dr. WILLIAMS has remarked that they are more distinct after meals and moderate exercise. After excessive exertion they are diminished. Fear, and the depressing passions, have a similar effect.

9. The respiratory sounds are greatly modified by age. From birth to the period of puberty, they are much louder and shriller than in after life, and the whole respiratory function more active. This state of the respiration has been called *puerile* by LAENNEC; and occurs sometimes in adults, either generally or partially, from momentary excitation, or the presence of disease in a part or parts of the lungs. At puberty the respiration is less noisy; and in a few years becomes much deeper, and assumes the adult character.

10. The vesicular sound being the result of the perfect penetration of the air into the lungs, its equal and simple presence is a sign of the healthy performance of the function. But this sound may vary in degree. It may be feeble in all parts, owing to constitutional peculiarity, or only in particular parts, when we should suspect disease; but it is no proof of disease, unless it be associated with certain peculiarities of sound hereafter to be noticed. The total absence of respiratory sound in a part indicates either the exclusion of the air from the part of the pulmonary tissue underneath, or effusion of fluids, or the introduction of air into the pleura. Here we must have recourse to *percussion*, in order to give precision to the information. (See Percussion.) In some cases the natural vesicular sound is absent, and a bronchial respiration is heard. In these we must infer that the vesicular murmur is suppressed by a condensation of the pulmonary structure, which, owing to this change, becomes so good a conductor of sound, that the bronchial respiration either becomes louder or is heard in unusual places. In other cases, a sound resembling the tracheal is heard in situations where vesicular respiration alone exists in health. This is caused by the passage of air into an ulcerated cavity or cavern communicating with the bronchi, and from this circumstance is called *cavernous* respiration.

11. *B. Of the morbid respiratory sounds.*—The respiratory sounds are not only varied in degree, but also in *kind*, or they are mixed with different *adventitious* sounds. These variations of *kind* are produced, 1st, by changes in the parietes and vicinity of the tubes, and in their secretions; and, 2d, by morbid states exterior to the pulmonary tissue. Under the first of these are ranked the different *varieties of sound produced by the presence of morbid secretions within the air-tubes, and the lesions producing these secretions.* This class of morbid sounds have been variously denominated. By the French they have been named *râle;* by some of our own writers the word *rattle*, and by Dr. Johnson the word *wheeze*, have been used. As we have no English term which so fully expresses the idea, to which this morbid sound gives rise, as the word *rhonchus*, adopted by Dr. Williams, and some French pathologists, I shall use it here.

12. *a. Moist crepitous rhonchus*, the *râle crepitant* of Laennec; the *crepitant rhonchus* of Dr. Williams, has its seat in the air-cells and minute bronchi. It resembes the sound from rubbing a lock of hair between the finger and thumb, when held close to the ear; or the crepitation of a piece of lung distended with air when compressed. It is generally uniform, and continues to the end of inspiration, and seems to arise from diminished calibre of the minute bronchi, owing to interstitial effusion, and the admixture of the respired air with the secreted or effused fluids in the air-cells and tubes. It is characteristic of incipient hepatisation of the lungs from pneumonia, and of its resolution; of œdema and apoplexy of the organ; sometimes of early phthisis, of pulmonary catarrh, and bronchitis. But it is only pathognomonic of the first stage of pneumonia; and the more viscid the mucus that is secreted, the more distinct is the crepitant character of the rhonchus. In the other diseases in which it occurs, the crepitation is less perfect.

13. *b. Dry crepitous rhonchus*, the *craquement* of Laennec, resembles the sound produced by blowing into a dried bladder, and conveys the impression of air distending lungs that have been more or less dried, and whose cells have been unequally, but much dilated. It is only heard during inspiration, and occurs only in pulmonary emphysema.

14. *c. Dry bronchial rhonchus.*—This is either *sibilous*, râle sibilant sec; or *sonorous*, râle sonore sec, of Laennec. The former is a low or loud, shrill or bass, and prolonged *whistle*, such as may be produced by air passing through a small circular aperture, and is owing to some contraction or constriction of the bronchi. The latter is a dull, prolonged, snoring sound; sometimes very loud. It occasionally resembles the bass note of a violoncello, or bassoon, or the buzzing of an insect. It seems to be produced by a flattened contraction in a bronchus of considerable size, leaving very little aperture; and arising from external pressure of the bronchial tube, from local thickening of its mucous lining, or from tenacious mucus within its canal. In a modification of the rhonchus, which Dr. Williams calls the *dry mucous rhonchus*, the sound resembles that of a click-wheel, and is produced by a portion of very adhesive mucus attached to the bronchial lining, which, yielding with a jerking resistance to the air forcing its passage, thereby occasions a ticking sound.

15. *d. The mucous rhonchus*, the *râle muqueux* of Laennec, the *humid rhonchus* of Dr. Williams, takes place in the bronchial tubes, and is produced by the passage of air through a thickish fluid, giving rise to a kind of *bubbling* within the air-tubes. It is most frequent in bronchitis and pulmonary catarrh, accompanied with mucous secretion; in hæmoptysis, in phthisis, in pneumonia, and in other diseases which are attended at any period with expectoration. This rhonchus is more gurgling, loud, irregular, and coarse, the larger the bronchi in which it is seated, the bubbles being there larger and more unequal. In the trachea, these characters are particularly marked, and have been denominated *tracheal* from this circumstance, by M. Laennec. In the smaller bronchi, on the other hand, this rhonchus is more equal, and its characters less remarkable, the bubbles being of much smaller size. The bubbles producing the mucous rhonchus must necessarily vary in their characters with the varying fluidity of the secretion, and thus the rhonchi will differ accordingly. If the fluid be very thin, the bubbles will be numerous, readily formed, and rapidly break: but if it be viscid, they will be fewer in number, and will often pass along the tubes for some way before they break, the sound being diffused, more regular, and rare. Also the continuance of the rhonchus will be an indication of the quantity of liquid present in the bronchi, as justly remarked by Dr. Williams. If this rhonchus accompany only the first part of inspiration and the end of expiration, the secretion must be scanty. But if the whole of the respiratory act be attended with this sound, then we may conclude that the quantity of fluid is considerable, and extends to the smaller bronchi.

16. *e.* The *cavernous rhonchus*, or *gargouille-*

ment; the *mucous rhonchus of morbid excavations* in the lungs, occurs when these cavities contain a fluid, and communicate with the bronchi. It generally exists in the advanced stage of tubercular phthisis, in abscess, and partial gangrene of the lungs. This rhonchus is characterised by a strongly marked mucous gurgling or bubbling sound, confined to a small spot and determinate situation, and is particularly marked upon the patient taking a full inspiration, or after coughing.

17. It may be remarked that this *class* of morbid respiratory sounds — proceeding from changes in the parietes of the tubes, and in their secretions — will sometimes be more or less obscurely heard through effusions in the pleura, when not very large. I proceed to consider the *second class* of morbid sounds, or *those arising from lesions exterior to the pulmonary tissue.*

18. *a. Metallic resonance*, tintement *metallique* of Laennec, is observed only when a quantity of air is accumulated in the pleural cavity, as in pneumothorax; or rarely in cases where very large tuberculous excavations are formed in the lungs. It is most commonly heard when both air and fluid are effused in the pleural cavity, and when there is a communication between this cavity and the bronchi. It is most distinctly heard upon coughing. Laennec has distinguished two varieties of this sound, namely, *metallic tinkling*, and *amphoric buzzing or resonance*. These sounds are occasioned by the impulse given to the air accumulated in the pleura, by the vibrations of air rushing through a fistulous opening in the pulmonary pleura, or striking against a condensed part of the pulmonary tissue, or of the pleura itself.

19. *b. Rubbing sound*, the *sound of friction*, the *bruit de frottement ascendant et descendant* of Laennec. This sound has been particularly investigated by MM. Honoré and Reynaud. It is an obscure, dull sound, perfectly distinct from the respiratory sounds, but synchronous with the motions of the parietes of the chest during inspiration and expiration, and resembling that produced by the rubbing of two soft and somewhat rough bodies on each other. It is loudest, or only heard, during inspiration. It is sometimes present in interlobular emphysema, but is more frequently and sensibly heard in pleuritis, with partial albuminous exudation, and with little or no effusion of serum.

20. II. Auscultation of the Voice. — The voice, although produced chiefly in the larynx, has its sound partially propagated inwards by the air in the trachea and bronchi, occasioning, in the smaller ramifications of the latter, a vibratory sensation or fremitus, rather than a distinct sound to the ear through the stethoscope; but, in persons with a large chest and strong voice, a more distinct vocal resonance. When the instrument is applied in the situation of the larger bronchi, as between the scapulæ and under the axillæ, the voice is heard much more distinctly, and the articulation may even be distinguished; but the sound does not seem to enter the cylinder, or to traverse its tube. If we place the stethoscope on the trachea or larynx, when the patient is speaking, we hear the whole of the words, loudly and articulately, and as if passing through the instrument to the ear. These sounds have been called, from their site, *bronchophony* and *laryngophony*; and arise from the vibrations propagated through the air contained in the trachea and bronchi, and which become weaker as they extend in the direction of the air-cells.

21. The degree of vocal resonance in the chest differs in different persons. It is loudest and most extensive in those who are thin, and have a strong, sharp, treble voice; so that natural bronchophony will extend further in young subjects and in females, particularly through the upper regions of the chest. In fat persons with a deep voice, the natural bronchophony is confined and obscure, especially during the deeper notes. In all the lower parts of the thorax, particularly during the deep tones of the voice, there is either no resonance, or merely a slight thrill or vibratory fremitus, which may likewise be felt upon applying the hand to its parietes. Such are the healthy sounds of the voice in different parts of the chest; but in certain states of disease they are very materially altered, and both the *bronchial* and *laryngeal* sounds are developed in places where they never exist in health. Of the various manifestations of these sounds in disease, I now proceed to take a brief notice.

22. *a. Bronchophony* is developed in disease by the same causes that render the bronchial respiration audible, viz. condensation of the substance of the lungs in the vicinity of large bronchial tubes, without diminishing their calibres, as in hepatisation or induration, from the formation of tubercular matter. From this circumstance bronchophony is an important symptom in pneumonia and phthisis. When the condensation is seated near the surface of the upper portions of the lung, and near a large bronchus, the sound may nearly approach laryngophony. The bronchial respiration is generally present with bronchophony, excepting when the hepatisation is extensive.

23. *b. Ægophony* (from *αἶξ, αἰγὸς*, a goat, the sound resembling the cry of this animal,) is merely a modification of bronchophony; and occurs when, with the circumstances which produce it, there are superadded the existence of a thin layer of fluid between the surface of the lungs and the pleura costalis. The bleating sound of the voice to which the term ægophony has been applied is variously modified in different persons, according to the natural tone of their voice, and the different modifications of the diseases which produce it: thus it will resemble the squeaking of Punch; or possess a shriller or sharper key, and sound more like the echo of the patient's voice than the voice itself. Ægophony only exists in pleurisy or slight hydrothorax, when the quantity of fluid effused is no more than forms a thin layer between the lungs and parietes of the chest. Laennec states that he has found this symptom present in almost every case of pleurisy; and considers it to be owing to the natural resonance of the voice in the bronchial tubes, rendered more distinct by the compression of the pulmonary texture, and modified by its transmission through a thin layer of fluid in a state of vibration. Dr. Williams ascribes it to "the successive undulations of the liquid, the result of an irregular transmission of the sonorous vibrations." Ægophony often co-exists with bronchophony, and the one passes into the other.

24. *c. Pectorilogy.*—The existence, in disease, of vocal resonance in any part of the chest, to the extent of laryngophony, has been termed *pectorilogy* by Laennec. It may be either *imperfect* or *perfect*. It is the result of a morbid cavity, formed in the substance of the lungs, and communicating with the bronchi; to which cavity the sound of the voice, or vibrations of the air in the tubes, is propagated. When the stethoscope is applied to a part of the chest, under which one of these cavities is situated, the words which the patient utters seem to proceed from that spot; and hence the term *pectorilogy*. " The distinction between perfect and imperfect pectorilogy is, as in the case of natural resonance, whether the voice seems to traverse the tube, or remain at the end; and the physical difference producing the two modifications consists in the size and situation of the cavity. The most perfect pectorilogy is produced in cavities of moderate size, which are situated near the surface of the lung, and freely communicate with a large bronchial tube. If the cavity be deep-seated, or if its communication with the bronchi be imperfect, the resonance of the voice will not amount to perfect pectorilogy. True pectorilogy produced by a cavity, is generally abruptly circumscribed, so that its limits can be distinctly traced."—(Williams's *Rational Exposition, &c.* p. 43.). Andral appears to be correct in considering perfect pectorilogy as not common, and that the imperfect state of this sound, or bronchophony, is very frequently mistaken for it. When present in any part of the chest where there is naturally no bronchial resonance, it may be considered as a certain indication of the existence of a morbid cavity, generally tubercular; and when heard in situations of natural bronchial resonance, although more doubtful, yet if it be perfect, distinctly circumscribed, and heard on one side only, the same conclusion must be come to. It may be further added, that an empty state of the cavity, its rounded and regular shape, and natural sharpness of the voice, particularly in women and children, tend to render pectorilogy perfect.

25. III. Auscultation of the Heart.—*A. In its healthy state.* I have always viewed Laennec's explanation of the sounds proceeding from the heart's contractions as the most defective part of the exposition of his system; and a similar opinion seems to have been entertained by Mr. Turner, Dr. Williams, and several others. The observations of Mr. Turner, and of Drs. Stokes and Corrigan, first shook the stability of the views of Laennec on this subject; and the recently published researches of Dr. Hope have almost altogether overthrown them. As I consider the exposition of the actions and sounds of the heart, given in Dr. Hope's work, to be the most accurate, I shall follow it on this occasion.

26. 1st. *Of the Contractions of the Heart in the order of their occurrence, &c.*—The first motion of the heart following the interval of repose, is the systole of the auricle. It is a very brief and slight contractile movement, most considerable in the auricular appendix, and propagated toward the ventricle, in the systole of which it terminates, by a nearly a continuous action. The systole of the ventricle commences suddenly, and diminishes considerably the volume of the organ. "Synchronous with the systole are the first sound, the impulse of the apex against the ribs, and the pulse of the vessels near the heart;" the pulse at the radial arteries following at a barely appreciable interval. The diastole of the ventricles follows their systole; and these compartments return, by an instantaneous expansive movement, to the same state as during the previous interval of repose. The diastole is accompanied with the second sound, with a rush of blood from the auricle, by a contractile motion of this cavity most observable at its sinus, and by a retrocession of the apex of the heart from the ribs. " Next succeeds the interval of repose, during which the ventricles remain at rest in a state of fulness, though not of distension, through the whole period intervening between the second and the first sounds; but the auricle remains at rest during the first portion only of that period, the remainder being occupied by its next contraction, with which recommences the series of actions described."—(Hope *on the Dis. of the Heart, &c.* p. 40.)

27. The *rhythm* of the heart, or the duration of the several parts of this series of actions, constituting what may be called a beat, is the same as described by Laennec:—1st, The ventricular systole occupies half the time of a whole beat; 2d, The ventricular diastole occupies a fourth, or at most a third; 3d, The interval of ventricular repose occupies a fourth, or rather less, during the latter half of which the auricular systole takes place.

28. 2d. *Causes and mechanism of the motion.*—The auricles, being always in a state of fulness, arrive, during the first half of the period of repose of the ventricles, at a state of distension, on which they react and propel a small additional quantity of blood into the full but not yet distended ventricles, in order to bring them to this state, and to cause them to react, and thus expel a greater or less portion of their contents. During the expulsion of the contents of the ventricles, Dr. Hope considers that the apex of the heart is tilted upwards and forwards, and occasions the impulse against the ribs, in consequence of the retraction of the ventricles upon their base, and on the auricles, which, being in a state of extreme distension, serve as a fulcrum beneath them. The *diastole* of the ventricles appears to be occasioned, 1st, by the relaxation of the principal part of their muscular structure, assisted by an elastic property; 2d, by the distension of the auricles, which has arrived at its height, and brings into action certain layers of ventricular fibres having a powerful influence in distending these cavities; 3d, by the width of the auriculo-ventricular opening, which allows the blood to rush instantaneously, and with facility, from the auricles into the ventricles. The blood expelled from the former cavities into the latter being instantly replaced from the venæ cavæ, distension of the auricles immediately recurs, and the same series of actions is continued.

29. 3d. *Causes of the sounds.*—There can be no doubt that the sounds of the heart's actions are not produced by the mere contraction of its muscular structure. To what other cause can we impute them? I conceive that they can only be referred to the action of the parietes of the cavities on the fluid circulating through them, and to the motions of this fluid. According to this view, which has been very diligently investi-

gated by Dr. Hope, the systole of the ventricle is the cause of the first sound, by the impulse it communicates to the blood, and the diastole of the ventricle is the cause of the second sound; owing, in the opinion of this writer, to the rush of blood from the auricles, produced as already explained (§ 26.), and the succession of the stream against the walls of the ventricle, when abruptly arrested by the completion of the diastole.

30. I consider that it is clearly made out, 1st, That the impulse, the pulse, and the first sound, coincide; 2d, That the ventricle is concerned in the production of the second sound, although the exact manner, in which the motions of the ventricle and this sound are connected, has not yet been conclusively ascertained; and, 3d, That the actions of the auricles are insufficient to produce either impulse or sound, and that neither the one nor the other result from them. With respect to the production of the second sound, I think that the opinions of Mr. Turner, Dr. Corrigan, and Dr. Williams, are untenable, and therefore may not be stated; and that the explanation of Dr. Hope requires further confirmation. From the third of these facts I believe that it may be legitimately inferred, that the physical signs of disease of the auricles are very imperfect, and therefore uncertain.

31. *B. Auscultation of the morbid sounds and impulse of the heart.* — 1st, *Of the impulse of the heart.* Although, strictly speaking, the sounds of this organ are the only objects of auscultation, yet, as the impulse or shock it communicates to a part of the chest is usually made a matter of enquiry, although by a different sense, during the time that auscultation is being performed, I will briefly notice it at this place. The impulse necessarily varies, even in health, in different persons, with the state of the heart's action, and the habit of body. It is also greatly modified by mental emotions, and by various affections of the digestive and other organs. It is always synchronous with the first sound of the heart; but, in rare cases, a slight second impulse also accompanies the second sound; but this is felt deeper in the chest; is more of an obscure tremor, much slighter in degree than the chief impulse or shock, and is only met with in cases of hypertrophy with dilatation.

32. When the impulse is prolonged, strong, and characterised by an extensive heaving movement, thickening of the walls of the ventricles may be inferred. It should, however, be recollected, that whatever excites the feelings of the mind, or hurries the circulation, will occasion a strong impulse; but, in such cases, the actions of the heart are also unusually frequent. *Morbid* impulse of the heart is present in the states of both mental and corporeal repose; and is often unconnected with increased frequency, as in hypertrophy of the ventricles.

33. The impulse may be diminished, even in health, as by the depressing passions. It is often constitutionally so small in amount as scarcely to be felt. It is also lowered by diseases of remote organs, as diarrhœa, &c., and by abstinence and blood-letting, and whatever depresses the energies of the system. It is generally weak in congestion of the cavities of the heart, in cases of thinning of their parietes, in the asthmatic paroxysm, in congestion of the lungs, in some cases of pneumonia, and in the advanced states of various diseases; and it may even, although very rarely, accompany certain states of hypertrophy of the heart, particularly during the operation of debilitating causes.

34. In health, the impulse is usually limited to the immediate region of the heart, and chiefly in the situation of the cartilages of the fourth, fifth, sixth, and seventh ribs. Its sphere is extended by increased action of the organ, whether the result of mental or corporeal excitement or of disease; by hypertrophy, and by certain organic changes of organs in the immediate vicinity. When the muscular parietes of the heart are increased without any dilatation of the cavities, the sphere of impulse is not extended far beyond its healthy site; but when dilatation is combined with hypertrophy, the impulse may often be felt on the right side of the sternum, below the clavicles, and even on the back. Diseases of adjoining organs, as hepatisation of parts of the lungs in the vicinity, effusions of fluids in the pleural or or pericardic cavities, tumours in the mediastinum, close adhesions of the lungs to the costal pleura, adhesion of the pericardium to the heart, displacement of the heart, and even an enlarged liver or spleen — when rising into the thoracic cavity, and pressing the diaphragm upon the pericardium — will extend, often to a considerable distance, the impulse of the heart, owing to the increased density of parts which receive the shock. Much discussion has arisen as to the manner in which the heart's shock is produced. Further than that it is occasioned by the muscular actions of the organ, I believe that the phenomenon has not been satisfactorily explained, at least in such a way as accords with the various conditions it presents in health and disease. The explanation given by Dr. Hope has been already stated (§28.).

35. 2d. *Of the changes produced in the natural sounds of the heart by disease.* — The sounds of the heart vary in different persons, even in health. In some they are loud and distinct; in others, the reverse: they may also be dull or clear, in respect of their key. They are generally distinctly heard by the unaided ear; but more accurately with the stethoscope. The impulse and sound are never both present in health, to a great degree, as they depend upon opposite conditions of the ventricles; the impulse being great in proportion to the thickness of the parietes of the ventricles, the sound to their thinness. The sounds of the left side of the heart are strongest at the junction of the cartilages of the left fourth, fifth, sixth, and seventh ribs, with the sternum: those of the right side, under the sternum and towards its right edge. The sphere of the heart's sounds is, in a very few persons, nearly limited to the sphere of impulse; but it is generally far more extended, even in health. It should not be overlooked, that the sphere of sound is much larger in children and young persons, in females, in the lean, and in those who have narrow or small chests; whereas, in persons whose thoracic cavity is large, and its parietes thick, muscular, or fat, the sound is heard much less extensively.

36. The sphere and loudness of the heart's sounds are increased by the same moral, physical, and morbid causes, which have been stated to

augment its impulse (§ 31.). Therefore, when frequency of pulse accompanies increase of sound, no actual disease may exist; but when a natural or slow state of the pulse is attended with an augmented range of sound, disease may be much more certainly anticipated. The circumstance of the sphere of sound being extended by the organic lesions already noticed as conveying the impulse of the heart (§ 34.), and by tuberculous excavations in the lungs, should not be overlooked. In taking account of the heart's sounds, we should also be aware that the sounds of respiration will occasionally mask them, as the heaving of the chest during inspiration will, in a slight degree, mask some of the shocks of the heart. Generally, the sounds of the heart are strongest in the left anterior part of the chest; and progressively weaker in the sternal, in the right anterior, the left posterior, and in the right posterior parts successively. If this succession be deviated from, or in any way altered, disease exists; and the degree, state, and order of deviation, become signs of some importance. It has been remarked by Laennec, that, when the sounds are heard beyond the healthy sphere, in persons with the chest well formed, and presenting none of the causes alluded to as giving rise to such extensive range, these persons will be found to be subject to palpitations, to shortness of breath upon the slightest exertion, to attacks of asthma, and to congestions of the internal viscera.

37. 3d. *Of the adventitious sounds of the heart.* — The sounds of the heart may not only be changed in degree, in extent of sphere, and in the succession of intensity, but entirely new sounds may be superadded. The most common of these are the bellows sound (*bruit de soufflet*), the saw sound (*bruit de scie*), and the rasp sound (*bruit de râpe*). These may either take the place of the natural sounds, or may be conjoined or superadded to them; and they may be present with either the first or second sound, or with both. The bellows sound resembles the puffing of a pair of bellows, and conveys the idea of smoothness. The saw and rasp sounds are so named from their similarity to the sounds occasioned by the sawing or rasping of wood, and convey the idea of roughness. But the bellows sound may insensibly pass into the others; and they all vary greatly in loudness. They may occupy the place of the first or the second of the heart's natural sounds, but more frequently that of the first than of the second. The saw and rasp sounds are generally louder, and present a wider range of intensity, than the bellows sound, which is more closely limited to the part which occasions it. They may all be heard in arteries at a distance from the heart, more particularly the bellows sound; and often when they do not exist in the region of the heart. When the saw-sound proceeds from the heart, it may generally be traced along the arch of the aorta to the subclavian and carotid arteries.

38. The causes of these sounds, and the exact site of the changes which produce them, are obviously the important considerations attached to them. They have been accounted for in various ways, even by their eminent discoverer; and, in general terms, they may be said to arise from unnatural or morbid motions induced in the current of blood circulating through the heart, instead of those natural motions which contribute to the healthy sounds of the organ. Hence, whatever produces the morbid change of the motions of the fluid, will occasion the adventitious sounds; and we have reason to infer that such change is produced either by a permanent alteration of the apertures and canals through which the blood is propelled, or by a spasmodic or nervous state of the same parts.

39. The simple bellows sound is more common, and arises from slighter changes than the saw or rasp sounds, and is less to be depended upon in diagnosis. Pressure on an artery will occasion it; and when present in the heart, it will sometimes be removed by blood-letting. When even existing permanently, although it is a very strong indication of organic change in the heart, it cannot be implicitly relied on; but when only occasionally present, although such change may be its cause, yet it deserves no reliance. The saw or rasp sounds are much less frequent than the other; are much more constantly found in connection with contracted orifices of the heart; and are very frequently indications of an increased degree of the same cause that produces the bellows sound. It may, however, be generally inferred, 1st, That these sounds arise from some change in the orifices of the heart's cavities, produced by nervous or temporary causes, or by alteration of structure; more frequently the latter. 2d, That these sounds, therefore, although they indicate the existence of organic disease, are not conclusive evidence of it, as they sometimes arise from other causes. 3d, That in proportion as these sounds possess more of the rasping character, the greater is the probability of organic change. 4th, If the sounds disappear after depletions, upon repose, or without sufficient reason, their dependence upon functional disturbance may be inferred, although not implicitly relied on; their continued absence, however, strengthening the conclusion. 5th, The continuance of these sounds, notwithstanding the means now mentioned, or their diminution merely, is nearly conclusive of organic change. 6th, Intensity of the sounds is no indication of the degree of valvular disease, or extent of the contraction of an orifice; as they may be weak, when these organic changes are extreme. A moderate contraction and size of current seem to be requisite to their full production. The relation of these sounds to the particular changes which occasion them is considered in connection with these changes. (See Heart — *Diseases of.*)

40. The rasp and saw sounds are often accompanied with a phenomenon resembling a species of impulse, and which can be estimated by the sense of touch only. This is the *thrill* or *purring tremor*, termed "*bruissement*" by Corvisart, and "*frémissement cataire*" by Laennec, which is felt when the fingers are placed upon the heart, or on an artery. When existing in the heart, the feeling excited upon applying the hand to the region of this organ, is analogous to the sensation occasioned by the saw or rasp sounds. The fact is, that the same pathological condition gives rise merely to modified sensations as perceived by the medium of different organs, the object exciting the sensations being one and the same; the only difference being, that a stronger current is required to produce the pur-

ring tremor, than is necessary to the production of the sounds. It is owing to this circumstance that it is strongest in hypertrophy of the ventricle, or when the circulation is hurried. A firm pressure of the hand on the region of the heart is necessary to feel it well; and a moderate pressure to feel it in the arteries.

41. The last adventitious sound that I have to notice is that which Laennec has termed the "*cri du cuir*," and which resembles the creaking of the leather of a new saddle. It seems to be chiefly observed in cases of pericarditis, when the opposing surfaces of the pericardium lose their lubricity, and when they are rendered rough by the exudation of coagulable albumen, or are in an unusual state of dryness; and to be occasioned either by their friction whilst in this state, or by the motions produced in that part of the pericardium reflected over the heart during the systoles and diastoles of the ventricles.

It is unnecessary to add any thing at this place, to what has been stated respecting the auscultatory signs in *diseases of arteries*, and particularly of the *aorta*. The employment of *auscultation of the abdomen*, in order to ascertain the existence of pregnancy, is comprised in the article Pregnancy.

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BARBIERS.

Classif. 4. *Class*, Nervous Diseases; 3. *Order*, Affecting the Muscles (*Good*). I. Class, IV. Order (*Author*).

1. Defin. *Tremor, with pricking, formicating pain; numbness of the extremities, principally of the lower, followed by contractions and paralysis of the limbs, inarticulation or hoarseness of voice, emaciation, and sinking of all the vital powers.*

2. This disease has been described by various authors since the appearance of the work of Bontius. But we have had no satisfactory account of it until Mr. Marshall furnished it in his interesting work on the diseases of Ceylon, and distinguished it from *Beriberi*, with which it had been confounded by Bontius, and recently by Dr. Good. Dr. J. Clark had, however, noticed it briefly as a distinct disease, many years previously; and the definitions of it given by Sauvages, Linnæus, Sagar, and Aikin, seem to indicate that they were not altogether unacquainted with its nature. I shall here follow the accounts of it by Dr. Clark and Mr. Marshall, as they seem to be the most precise, and to have been the result of much experience.

3. Symptoms. — The disease generally commences with a formicative pricking pain in the muscles of the lower extremities, with numbness, tremors, and an imperfect command of the powers of locomotion. Both lower limbs are always equally affected. In some cases the forearms and hands, and the powers of articulation, are subsequently similarly seized. As the disease advances, the patient is unable to walk steadily. Standing or walking aggravates the uneasiness of the limbs, and either is impossible without support. The superior extremities become incapable of performing their usual offices; and want of sound sleep, great sluggishness, and inactivity, are complained of. The limbs afterwards are deprived of all feeling, and lose their natural temperature; the extensor muscles become quite paralytic, and the limbs contracted. Loss of appetite, indigestion, emaciation, &c. soon follow; and the pulse gradually sinks to a frequent, thready, or fluttering state; all the vital powers become depressed, and death supervenes. As respects its *duration*, it may be protracted for many months, and it may present various grades of severity. Its forms are frequently more mild, the above description applying to the severer cases. The *diagnosis* of barbiers is described in the article Beriberi, with which disease it has often been confounded.

4. Mr. Marshall observed many cases of this disease, in 1812, amongst the Caffres composing the 4th Ceylon Regiment. He never noticed it amongst the indigenous inhabitants of this island; and, from every information he could collect, it was only known amongst Africans who had arrived in the island; and he believed that late comers were more disposed to it than acclimated residenters. Mr. Marshall also met with it in Europeans in Ceylon: and he has observed an analogous affection in horses and dogs; from which, however, he never knew them to recover.

5. Dr. Lind states that barbiers is a species of palsy frequent in India, affecting chiefly the lower classes of Europeans, who frequently sleep, when intoxicated, in the open air, exposed to the land winds; and that its attack is sudden, depriving the limbs of motion, &c. It appears also to prevail in Java. Dr. Bostock has described a case which seems to be nearly allied to this affection: and I have, for several years, been occasionally consulted by a patient, whose complaints are very nearly the same as those now described; and who had been previously seen by several medical men, and by some since he was under my care.

6. The remote Causes of this affection are cold and moisture applied to the body; intoxication, irregularities, and excesses consequent upon inebriety; violent exercise in the sun; lying down in the open air during the heat of the day; exposure to the cold chilling dews of the night, or sleeping when thus exposed; suddenly obstructed perspiration, by currents of air; long fasting, and whatever exhausts the energies of life. The translator of Bontius's work states that barbiers is frequent on the Malabar coast, where it attacks those who unwarily sleep exposed to the land winds, particularly in the months of January, February, and March; and that it is seldom cured till after the shifting of the monsoon, unless the patient changes the climate.

7. Treatment. — This affection appears to originate in depressing and debilitating causes; to be characterised by a gradual and chronic sinking of the nervous energy; and therefore to require

a tonic, restorative, and stimulating treatment. Frictions, with stimulating liniments along the course of the spine, and on the limbs; attention to the due performance of the secreting and excreting functions; tonics, combined with warm cardiacs, gentle aperients, and antispasmodics; vesication; stinging with nettles; electricity; the internal use of the extract of nux vomica, or of strychnine; the application of external warmth, and the use of warm clothing; a nourishing and digestible diet; regular habits, and change to a healthy air or locality; are the chief means of cure. Dr. John Clark states, that the few Europeans whom he saw ill with this disease were cured by a change of climate, and a sea voyage. In other respects, the treatment is the same as that recommended in the article Palsy, particularly palsy from lead. (See Colic — *from Lead*, and Palsy.)

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BERIBERI. Syn. *Beriberia*, *Synclonus Beriberia*, Good. *Hydrops Asthmaticus*, Rogers.

Classif. 4. *Class*, Diseases of the Nervous Function; 3. *Order*, Affecting the Muscles (*Good*). I. Class, V. Order (*Author*).

1. Defin. *Oppressed breathing; paralytic weakness, numbness, and stiffness of the lower extremities; general œdema, with a swollen and bloated countenance.*

2. Symptoms. — The attack is in some cases gradual; in others sudden and severe. When it is the former, which is more commonly the case, the patient complains for several days of weakness, and inability or unwillingness to exert himself. To these feelings, pain, numbness, and stiffness of the lower extremities, accompanied with œdema; muscular weakness, and dyspnœa, particularly upon motion; a feeling of numbness, fulness, oppression, and weight at the scrobiculus cordis; extension of the œdema over the body, and leucophlegmatic tumescence of the countenance, supervene. As the disease advances, the dyspnœa increases, and the face is more swollen and bloated. The lips, which were at first pale, become bluish and livid; and the lower extremities more numb and feeble, or even paralytic. The stomach is often irritable, especially in the advanced stages of the disease, when it often rejects all ingesta; the bowels constipated; the urine scanty, high-coloured, and sometimes almost suppressed: the pulse is at first either more or less quick, small, and hard, or but little affected; subsequently irregular or intermittent; and the dyspnœa at last becomes distressing and attended with great anxiety, and sometimes with a peculiar fluttering about the heart, and sinking or leipothymia, succeeded by palpitations. In the more advanced stages of the disease the patient cannot lie down; his sleep is uneasy, interrupted, and always unsound; and the recumbent posture induces violent palpitations, sense of suffocation, and anxiety. The oppression at the præcordia and weight at the scrobiculus cordis increase, and are attended with spasms of the muscles of the thorax and abdomen; the countenance becomes livid, and the extremities cold; vomiting is either frequent or nearly incessant; the pulse sinks, and the patient dies nearly in a state of suffocation.

3. In this, the most common form of the disease, it usually runs its course in about three weeks or a month; but sometimes, in slighter cases, the patient experiences several relapses, and is at last carried off unexpectedly, when the anasarcous symptoms have nearly disappeared, and he has been judged convalescent. In some of the milder attacks, several of the above symptoms are extremely slight, and the disease is altogether of much longer duration, or consists apparently of several distinct seizures. Such seem to have been the form of the majority of cases which Mr. Marshall has given in his work. In the most sudden and severe attacks, however, the pain, numbness, stiffness, and œdema of the lower extremities; the dyspnœa and anxiety, and all the more urgent symptoms, are either present from nearly the commencement, or they rapidly supervene to each other, and the patient dies in a few hours, or in a day or two. Such cases appear to be not so frequent as those which are more mild.

4. Remote Causes. — This disease is nearly peculiar to India, and is most prevalent in various part of Ceylon, on the Malabar coast, and in that tract of country which extends from Madras to Ganjam; being, according to Mr. Hamilton, confined to these parts, and extending no further inland than forty miles. It is most prevalent during the decline of one monsoon and the setting in of another, when the air is damp, cold, and loaded with vapours, and the vicissitudes of temperature greatest. Captain Percival, in his "History of Ceylon," ascribes it to low diet and bad water, and partly to the dampness of the climate. Mr. Ridley, however, states that the worst cases he had of it at Trincomalee, where it was remarkably prevalent, occurred during the change from wet to dry weather, when a strong and hot land wind prevailed; and that its severest prevalence at Pulitoopané was during dry weather. In the Indian peninsula it seldom extends further inland than sixty miles; but in Ceylon, particularly at Kandy, it has prevailed under very different circumstances, as respects season, states of atmosphere, and topography. It seems to have been much more prevalent in particular districts, where it may be said to be endemic, in one year than in another; and to have assumed, at distant periods, a nearly epidemic form. Dr. Christie states, that a residence of several months in the district where it prevails is necessary to its production; and Dr. Rogers never observed it in any person who had not resided six months or upwards in Ceylon. Dr. Hunter has met with it also in Indian seamen, particularly Lascars, after exposure to a moist and variable atmosphere and privations of food.

5. Opinions respecting both the remote and proximate causes of the disease differ very materially among those who have had opportunities of observing it. Mr. Dick found it most prevalent amongst soldiers who had taken much mercury for venereal complaints, and who were addicted to spirituous liquors. He never met with it in the officers. Mr. Ridley, on the other hand, states,

that, in 1804, " both officers and privates fell victims to it." Drs. CHRISTIE and ROGERS view it as a consequence of deficient and poor diet, impure and moist air, and of prolonged exposure to marsh exhalations; and consequently as a disease of debility, — an opinion which is in accordance with that of Mr. DICK and Mr. RIDLEY. Mr. COLQUHOUN found it to prevail notwithstanding prophylactic measures founded on these views; and Mr. MARSHALL did not observe it to occur amongst the troops in Ceylon, when exposed to the causes to which Drs. CHRISTIE and ROGERS impute it; and from that circumstance, as well as from the effects of medicines, thinks it a disease of increased vascular action; in which opinion Mr. HAMILTON agrees with him.

6. *Appearances on dissection.* — There is always a leucophlegmatic appearance of the surface, with œdematous effusion to a greater or less extent in the sub-cutaneous cellular tissue, and paleness of the muscles; sometimes with a watery obesity and deposition of fat in the abdominal regions. Occasionally there is fluid effused between the membranes of the brain, and in the ventricles; with vascularity of the encephalon, and slight appearances of congestion in the spinal canal. Serum is always found effused in the pleural cavity, and very frequently in the pericardium. The lungs are gorged with dark blood, and their structure more or less œdematous. Old cellular adhesions are sometimes found connecting the opposite surfaces of the pleuræ. The heart is generally soft, enlarged, and flabby. The peritoneal sac often contains much serum; and the liver is always found engorged with dark blood, is unusually large, and of a very deep colour. The spleen is generally very soft, large, and is, as well as the large veins, loaded with black blood. Sometimes inflammatory appearances are observed in the diaphragm and serous surfaces; but these are only occasionally and very loosely noticed. (CHRISTIE, ROGERS, MARSHALL, and HAMILTON.)

7. *Nature of the disease.* — It is evident that the nature of this disease can be inferred only from what is known of its exciting causes, and the appearances presented after death. Of the former we have very imperfect, loose, and conflicting information: of the latter no precise and minute account. It is difficult to explain the early occurrence of the paralytic symptoms. The spinal chord, brain, and nerves supplying the lower extremities, have not been sufficiently investigated to warrant a positive opinion as to the particular state of these parts, to which these symptoms may be referred. They may, however, depend upon congestion of the veins and effusion of fluid within the spinal canal. The dyspnœa is evidently owing to congestion of the lungs, and œdema of their structure; and the feeble and irregular action of the heart may be imputed to the weakened vital energy and structure of the organ, in connection with effusion of serum in some cases into the pericardium. The effusion of fluid within the serous cavities may, like other effusions, depend upon very different states of the vessels and serous membranes. By Mr. MARSHALL and Mr. HAMILTON it has been viewed as the result of inflammatory action. But where there is merely an effusion of a limpid serum, without either albuminous flocculi or adhesions, there evidently can exist no actual inflammation. Viewing the antecedent symptoms in relation to the post mortem appearances, as far as both have been described, it may be inferred that the disease is more dependent upon active congestion of the lungs, liver, and spinal chord, than upon any of the usual states of inflammatory action; and that this congestion is intimately connected with weakened power of the nervous and circulating systems; manifested chiefly in the heart and extreme capillaries of the cellular and serous structures, with imperfect function of the liver and lungs, and with effusion of serum to a greater or less extent into the shut cavities and cellular structures of the body; giving rise to a nearly universal acute dropsy, and complicated with more or less of paralysis of the lower extremities.

8. DIAGNOSIS. — The paralytic symptoms, constant dyspnœa, universal œdema, and leucophlegmatic intumescence of the countenance, characterise this disease sufficiently, and distinguish it from the *cachexia Africana*, with which it has been considered as being allied (see CACHEXY — *African.*). It has been, however, more commonly confounded with *barbiers;* but the history of both diseases show a very obvious difference between them. Barbiers is a very chronic disease, in which the paralytic symptoms, tremors, spasms, and contractions of the limbs, and emaciation, are the most remarkable symptoms; whilst the present malady is extremely acute, often of very short duration, and is characterised by general œdema, dyspnœa, the suddenness of its fatal termination, and the frequency of its occurrence. The former is, in fact, a species of *paralysis;* whilst the latter is a form of *acute dropsy*, very generally diffused throughout the body, and complicated with slight paralytic symptoms.

9. TREATMENT. — According to this view of the disease, the discordant accounts given of the success of treatment will be readily accounted for. When the disease prevailed very generally in the Carnatic, during 1782 and 1783, Mr. DICK, who appears to have treated a very great number of cases, found most advantage, during the former of these two seasons, from a pill, containing a quarter of a grain of extract of elaterium combined with extract of gentian, given every hour, until copious watery evacuations were procured; and this plan was repeated every third or fourth day, till a cure was accomplished. In the following season this treatment was not so successful. He found most advantage from large doses of spirit of nitre, antimonial wine, frictions with warm camphorated oil, aperient medicines, and wine to support the strength. Bleeding and mercury were tried without benefit. Dr. CHRISTIE recommended mercury, to excite ptyalism, combined with squills; cordial liquors, consisting chiefly of gin punch; stimulating pediluvia, with warm liniments; and when the patient was convalescent, tonics, composed of bark, wine, and porter. In more urgent cases, he prescribed blisters to the chest, and brandy, æther, and laudanum, to relieve the vomiting, dyspnœa, and spasms. He found digitalis of no service. Mr. HAMILTON's first cases terminated fatally under the plan recommended by Dr. CHRISTIE; and Mr. COLQUHOUN trusted to mercury, but found that many of the patients who

died in hospital of the disease were in a state of salivation from this medicine.

10. This want of success led later writers on the disease to have recourse to other means. Dr. Hunter had tried blood-letting in one case, without any apparent effect either one way or another. Dr. Rogers stated, in his thesis on the disease, that blood-letting hastened the fatal termination: but, according to Mr. Hamilton, he has since prescribed it succsssfully. Mr. Marshall appears to have been the first to employ blood-letting in a decided and successful manner in the treatment of beriberi; and the same practice was adopted by Dr. Paterson (Marshall, *on Ceylon, &c.* p. 161.), and by Mr. Hamilton. The bleeding was large, and repeated; and followed with the internal and external use of mercury, laudanum, and the vapour bath. To these were added purgatives of calomel and camboge.

11. The practice of Mr. Ridley, who experienced, himself, two very severe attacks; and who, excepting only Mr. Dick, has had the most extensive experience as respects this disease, having treated almost a hundred cases in one year (1814); recommends a nearly similar treatment to that advised by Mr. Dick. In the early stage, he directs purgatives of calomel, jalap, and crystals of tartar; the lower extremities to be well bathed, afterwards rubbed with camphor and oil of turpentine, or with the mercurial liniment, and then rolled in flannel bandages. He subsequently prescribes a pill, composed of one or two grains of calomel and two or three of powdered squills, every third hour; and a solution of crystals of tartar, as common drink, or made into punch with geneva or arrack. In the more advanced stages, he advises blisters to the back of the neck, or to the seat of pain and tightness; the warm-bath; frequent fomentations of the legs and abdomen, followed by frictions with mercurial ointment, camphor, and oil of turpentine; and clysters with æther, and purgatives. When the dyspnœa, spasms, and vomiting are urgent, he states, that he has given large doses of opium, æther, and brandy, with stimulating diuretics. When they could be retained on the stomach, small and repeated doses of camboge were also exhibited.

12. From the above statements, as well as from the varying character of the disease in Europeans and natives, in different seasons, as observed by Mr. Dick, and in various localities; —judging also from the nature and combination of the remote causes, and from the *post mortem* appearances; — I should infer, that a depletory treatment may sometimes be required amongst Europeans; and that the means of cure should be modified according to the characters of the malady and the state of the vital energies; that, on some occasions, general blood-letting — in others, cupping in the course of the spine; blisters; free purging with calomel, camboge, jalap, elaterium, &c.; antispasmodics, consisting of opium, æthers, brandy in some cases, camphor, &c.; diuretics, such as squills, cream of tartar, juniper, terebinthinate preparations, &c.; the vapour bath, or fomentations, followed by frictions with stimulating liniments, mercurial or camphorated liniments, with oil of turpentine, camphorated oils, along the spine and lower extremities; expectorants, consisting of ammoniacum, ipecacuanha, camphor, &c.; constitute the chief means that are likely to remove the internal congestions, to reduce the circulating fluid to a nearer equality with the vital power, to restrain effusion, and to restore the various secretions and excretions of the body. After these means have been judiciously administered according to the peculiarities of the case, or when circumstances seem to require it earlier in the treatment, stimulating and restorative medicines may either be conjoined with the above, or be exhibited on such occasions as may require them.

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BLOOD. Syn. *Αἷμα*, Gr. *Sanguis*, Lat. *Sang*, Fr. *Das Blut*, *Geblut*, Ger. *Sangue*, Ital.

Classif. General Pathology—*Ætiology*, *Semeiology*. — General Therapeutics.

I. States of the Blood in health. — 1. *A. Of the states of the chyle.* In order to acquire accurate ideas respecting the blood in disease, it is necessary to be acquainted with the varying conditions and appearances of the chyle, according to the food, from which it is chiefly elaborated. To these, however, I can only briefly refer. This fluid, when removed from the thoracic duct, is usually of an opaque white or opalescent appearance, and separates into a serous portion, and more or less firm clot. The former resembles the serum of the blood, the latter consists chiefly of fibrine. If the animal have been fed with fat animal food, the chyle at the time of coagulation assumes a rose colour, and, in addition to the separation of the clot, which falls to the bottom of the vessel, a thin liquid oily layer forms on the surface of the serum. In animals fed on vegetable food, the chyle is generally opaline and nearly transparent, and separates into a serous fluid and a small fibrinous clot only. According to MM. Prevost and Dumas the chyle contains globules, similar to those contained in the blood, but of a smaller size. The fibrinous coagulum seems to be formed from their aggregation. The serum of the chyle also contains albumen, and the saline ingredients found in the serum of the blood.

2. *B. The globules of the blood*, particularly in respect of their relation to the other constituents of this fluid, and the changes they experience when removed from the blood-vessels, excite the utmost interest in the mind of the pathologist. It is evident that they are suspended in the serum by means of the vital influence which the blood derives from the vessels and organs in which it circulates. According to the microscopic researches of Sir E. Home, Mr. Bauer, and of MM. Prevost and Dumas, they consist of a central colourless spheroid; and of a species of membranous sac of a red colour, surrounding this spheroid, from which it readily separates after death. The central bodies are transparent and spherical in the mammalia; and, when deprived of their coloured envelopes, are generally disposed

to assume ranges or fibrous meshes. The coloured portion appears to be a kind of jelly, easily divisible; but insoluble in water, from which it may be separated by repose. It is likewise transparent; but much less so than the central corpuscle: and the fragments arising from its division are not susceptible of regular aggregation.

3. *C. State of the blood in the vessels.* — According to the observations of Kolk, Treviranus, and others, the globules of the blood possess a rotatory motion during life, independently of the motion arising from the impulse of the heart; and this motion continues till coagulation takes place. More recently, this subject has been investigated by Professor Schultz, of Berlin, who has confirmed the fact respecting the intestine motion of the globules, by virtue of which they move on by themselves, surrounded by envelopes of colouring matter, and keeping at a distance from one another. This force, with which the globules of the blood are endowed whilst circulating in the vessels, I have, in my physiological notes, imputed to the influence exerted by the ganglial nerves on the interior of the vessels, which they every where so abundantly supply, as stated in the article on the pathology of the Arteries. But, besides this force of mutual repulsion, to which the fluidity of the blood is evidently owing, under the vital influence exerted by the organic nerves on the vessels, there is evidently another force also in action, by which the globules are attracted by the tissues, when they are brought more intimately in contact with them during their circulation in the minute vessels. Whilst, then, the former force keeps the globules in a state of constant motion and repulsion, and is exerted in the stream of the circulation, the latter tends to bring the globules to a state of repose, and is exerted in the organic structures themselves, at the point of contact of the solids and the globules. This latter force, which was first very minutely examined by Professor Schultz, and briefly stated by M. Andral, in his Pathological Anatomy, without acknowledgment, may be compared to a vortex, whence globules constantly pass from the arterial or terminal capillaries, and are lost in the different tissues. So that, although the vital endowment of the blood is manifested by its fluidity in the vessels, it assumes an opposite manifestation in the capillaries, where this fluid is brought within the sphere of the vitality of the different structures; each one attracting from it those constituents of which itself is formed, and which are always present in healthy blood.

4. Thus we see organisation commencing in the chyle, advancing further in the blood, and reaching its acme in the vital attraction of the constituents of the tissues from the blood circulating in the capillaries which supply them. At this part of the circle, where the arterial capillaries, with the fluid circulating through them, become, as it were, confounded with the tissues in which they are distributed, there appears, according to Professor Schultz, to be not only a constant attraction of particles by the tissues from the blood, but also an equal extrication of other particles from them into the blood received by the radicles of the veins. Thus it appears, that as the proximate constituents of the different tissues exist in the blood, as was first shown by Dr. Prout, and subsequently insisted on by Majendie and Andral; and as these become identified for a time with them, are afterwards detached, and flow back into the current of the circulation; the intimate connection and mutual dependence of the blood and the different solids, both in health and disease, ought not to be overlooked. But it is at the same time manifest that these constituents are kept in solution during circulation, and attracted during nutrition, by the vital influence; that the various parts into which the blood separates on removal from the vessels are only indications of its condition when circulating through the frame; that no such separation occurs in the healthy body, and never, excepting very partially, in disease; that this change proceeds from the loss of vitality sustained by the blood when removed from the frame, and that the phenomena connected with it have an intimate relation to the vital endowment of this fluid, derived from the vessels and the nerves supplying them.

5. *D. Coagulation of the blood.* — This process is modified by numerous circumstances, and by various diseases. Generally, however, the blood soon separates into two portions — the serum, and the coagulum or clot; and in this separation the red globules are principally concerned; it being chiefly the result of the loss of the vital motion which these globules possess in the vessels, and of the attraction existing between the colouring envelopes and central bodies. As the vital attraction, which keeps the red substance fixed around the whitish corpuscles, ceases soon after the removal of the blood from the vein, these bodies can then obey the force which tends to unite them, and they then form a net-work, in whose meshes the liberated red particles are entangled, and thus produce the phenomena of coagulation. If the coagulum be exposed to a stream of water, the colouring matter is washed away, while the aggregates formed by the colourless corpuscles remain in the form of filaments, in which may be recognised an analogous structure to muscular fibre, and constitute the fibrine of the blood.

6. It seems extremely probable, that the colourless globules observed in the chyle form the central corpuscles, and, when they have acquired their coloured envelopes in the progress of sanguifaction, constitute the red globules. And it appears equally reasonable to infer, that both the suspension of the globules in the serum, and the attraction between their coloured envelopes and colourless corpuscles, are entirely vital, inasmuch as both phenomena cease soon after the blood is removed from its source of vital endowment: and that vital manifestations become first apparent in the chyle, and still more so in the blood; coagulation being the result of the loss of this endowment, and taking place with a celerity in proportion to the rapidity of its departure. In cases where the vital energy, or that manifestation of it exerted by the organic nerves on the vascular system, is unexhausted, or is in a state of healthy excitement, coagulation is perfect and somewhat slow; but where it is depressed or exhausted, this process is quicker, but much less complete. Besides these, it presents various other phenomena, which are intimately connected with the nature of morbid actions, and which I shall notice immediately.

7. E. *Chemical relations of the blood in health.*—The analysis of the blood given by M. Le Canu, who obtained the prize given by the Académie Royale de Médécine of Paris, is extremely minute; and, as respects the principal ingredients, agrees very closely with the results stated by Berzelius and Marcet. The oily matter first detected in the blood by Dr. Trail, and subsequently found by Drs. Christison and Babington, has likewise been recognised by him as constantly present in the *serum*. The results of the analysis of the *serum* by Le Canu, Berzelius, and Marcet, are as follow:—

	Le Canu.		Berz.	Mar.
	1st Anal.	2d Anal.		
Water	906·00	901·00	905	900·00
Albumen	78·00	81·20	80	86·80
Animal matter sol. in water and alco.	1·69	2·05	—	—
* Albumen, combined with soda	2·10	2·55	—	—
Crystallisable fatty matter	1·20	2·10	—	—
Oily matter	1·00	1·30	—	—
*Muco-extractive mat.	—	—	—	4·00
*Extractive mat. sol. in alcoh. and acetate of soda	—	—	4	—
Hydrochlorate of soda and potash	6·00	5·32	6	6·60
Sub-carb. and phosph. of soda and sulph. potassæ	2·10	2·00	3	2·00
Phosph. of lime, magn., and iron, with sub-carb. of lime and mag.	0·91	0·87	—	0·60
Loss	1·00	1·61	1	—
	1000·00	1000·00	1000	1000·00

8. The *blood*, according to M. Le Canu, consists of the following constituents:—

Water	780·145	786·590
Fibrine	2·100	3·565
Albumen	65·090	69·415
Colouring matter	133·000	119·626
Crystallisable fatty matter	2·430	4·300
Oily matter	1·310	2·270
Extractive mat. soluble in alcohol and water	1·790	1·920
Albumen combined with soda	1·265	2·010
Chloruret of sodium and potassium, alkaline phosphate, sulphate, and subcarbonates	8·370	7·304
Subcarbonate of lime and magnesia, phosphates of lime, magnesia, and iron, peroxide of iron	2·100	1·414
Loss	2·400	2.586
	1000·000	1000·000

According to some chemists the blood also contains carbonic acid (Vogel and others); a yellow colouring matter, resembling that of the bile and the urine (Chevreul, Lassaigne, &c.); and a substance analogous to urea (Prevost, Dumas, Vauquelin, and Segalas). Vauquelin and Chevreul consider the fatty matter to be similar to that of the brain and nerves.

9. *a.* The quantity of *water* in the blood of a healthy person varies, according to M. Le Canu, in 1000 parts, from 853·135, the maximum, to 778·625, the minimum. He found the medium quantity in males to be 791·944, and of females 821·764. The quantity also appears to vary with the temperament; as the *lymphatic* temperament in the male furnished 830·566, of the female 803·716; and the *sanguineous* in the male 786·584, in the female 793·007.

10. *b.* The *albumen* contained in 1000 parts of blood varies from 78·270, the maximum, to 57·890, the minimum. It is nearly the same in the male as in the female, being only about one part more in the former. The difference in the quantity appears to have no relation to the temperament, nor to the age of the subject, from twenty to sixty years.

11. *c.* The quantity of *fibrine* contained in the coagulum varies extremely. According to Berzelius it is only ·75 for 1000 of the blood. M. Lassaigne states, that the fibrine of the blood of a young vigorous man is only $\frac{17}{10000}$ of its weight. In the researches of M. Le Canu, who has investigated the subject more closely than his predecessors, the quantity of dry fibrine contained in 1000 parts of blood varies from 1·360 to 7·236—the medium of twenty-two experiments being 4·298. It appeared to be greatest in the young or middle-aged of the sanguine temperament, and in the inflammatory state; and least in the lymphatic constitution, the aged, and those suffering under congestion or hæmorrhage.

12. *d.* The proportion of *globules* varies much more remarkably in the blood of a healthy person, than that of the albumen; the maximum being 148·450, the minimum 68·349., and the medium 108·399, in 1000 parts of blood. The medium quantity in males was 132·150, and in females 99·169. The periods of life intervening between twenty and sixty years had no influence on its quantity; but it was found to vary with the temperament. The medium quantity in the *lymphatic* temperament was 117·300 among females, and 116·667 among males; and in the *sanguineous* temperament, 126·174 in females, and 136·497 in males; giving 19·830 more globules to the sanguine temperament in 1000 parts of blood. M. Le Canu found the globules of blood greatly diminished in females subject to a copious flow of the menses. The quantity of globules is also, relatively to the other constituents of the blood, greatly diminished by blood-letting, whilst the albumen is not sensibly affected. Thus, a first bleeding furnished in 1000 parts of blood 792·897 of water, 70·210 of albumen, 9·163 soluble salts and animal extractive matters, and 127·73 of globules; but a third bleeding a few days afterwards in the same patient (a female), gave 834·053 of water, 71·111 of albumen, 7·329 of soluble salts and extractive matters, and 87·510 of globules.

Bibliog. and Refer.—*Marcet*, in Transact. of Medico-Chir. Society of Lond. vol. ii. p. 365.—*Berzelius* and *Marcet*, in Ibid. vol. iii. pp. 199. 231.—*Prout*, Inquiry into the Origin and Properties of the Blood, in the Annals of Med. and Surg. vol. i. pp. 10. 133. et 277.—*Home* and *Bauer*, Philos. Trans. for 1820.—*Home*, in Ibid. for 1826, p. 189.—*Prevost* et *Dumas*, Mémoires de la Soc. de Physiq. et d'Hist. Nat. de Génève, t. i., et Bibliothèque Univers. Juillet, 1821.—*Author*, Appendix to M. *Richerand*'s Elements of Physiol. 2d edit. p. 637.—*Scudamore*, Essay on the Blood, &c. 8vo. Lond. 1824.—*Schultz*, Révue Médicale, t. i. 1825, p. 136., et Journ. de Prog. des Sc. Méd. t. v.—*Bostock*, in Edin. Med. and Surg. Journ. vol. xxxi. p. 114.—*Adelon*, Physiol. de l'Homme, t. iii. p. 110, *et seq.*—*Le Canu*, Nouvelles Récherches sur le Sang, in Journ. de Pharmacie, Sept. et Oct. 1831.

II. Exuberance of Blood, *Plethora* (πληθώρη, *repletion*).

Syn. *Polyæmia* (Auct. Var.). *Hyperæmia, pléthore*, Fr. *Die Vollblütigheit*, Germ. *Pletora*, Ital. *Excessive Fulness of Blood.*

Classif. Pathology—*Ætiology*. IV. Class, II. Order (*Author*, see *Classif.* in *Preface*).

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* Probably the same constituents, differently named, and more minutely examined, by M. Le Canu.

13. DEFIN. *Greater fulness of the vascular system than is compatible with the continuance of health; or repletion of this system.*

14. The importance of attending to the varying states of the circulating system, in respect of both *exuberance* and *deficiency* of the fluid contained in it, has been acknowledged since the time of GALEN. After the doctrine of nervous influence had superseded the humoral pathology, the state of the blood in disease experienced a more general neglect, than the part actually performed by this fluid in the causation and perpetuation of morbid actions ought to have procured for it. Yet have there always been a succession of able observers and writers, who have never lost sight of the influence of the *quantity* as well as *quality* of the blood in producing, as well as in modifying, disease; and more recently the subject has deservedly received an increased and an increasing attention. *Plethora* is the opposite of *anæmia:* both may be, to a certain extent, compatible with health; but both predispose more or less to disorder, and, beyond certain limits, constitute distinct and opposite states of disease.

15. *A. General plethora.*— GALEN, BAILLOU, FERNEL, RIVIÈRE, and others, considered plethora to be of two kinds; to which subsequent writers added two more. As these distinctions are still, in several respects, founded in truth, notwithstanding the neglect into which they had long fallen, I will here briefly notice them. 1st, True or absolute plethora—*plethora ad vasa;* 2d, Apparent or false plethora—*plethora ad volumen;* 3d, Plethora relative to space—*plethora ad spatium;* 4th, Plethora in relation to vital power — *plethora ad vires.* It will be observed that the first and second of these, the species recognised by the earliest writers, are still upon the whole the most important. In the *first,* the blood is permanently increased beyond the wants of the system. In the *second,* plethora is merely a passing occurrence, arising from temporary causes, as the general turgescence occasioned by sudden or high ranges of temperature, &c. In the *third,* the blood may not be increased, but its relative quantity may be too great, as is observed after amputations of one or two limbs. In the *fourth,* the quantity may not be too great, if this fluid were actuated by a healthy state of the vital energy: but it may be excessive in respect of the influence by which it is circulated in all parts of the body. Now, those distinctions are actually founded in nature; and although they may all be resolved into one pathological proposition, viz. greater repletion of the vascular system than the wants and conditions of the economy require, still they must have become matters of experience to every one whose range of observation has been such as entitle his opinions to respect. I shall merely remark upon such of them as admit of dispute.

16. False plethora is very generally observed to occur in persons suddenly exposed to elevations of temperature, and depends more upon the effect of heat in exciting the vital turgescence of the capillary vessels, whereby a craving for fluid is created, and a larger quantity is absorbed, than upon the expansion of the fluids themselves, owing to the increase of temperature. A state of false plethora is very frequently occasioned,— and is often productive of more serious consequences than have generally been imputed to it, — by *ingurgitation* and increased temperature conjoined; and it should not be overlooked, that these combined influences not infrequently affect those who are already permanently plethoric. This will be more forcibly and truly shown by what must have fallen under the observation of many. A red faced, full veined, and robust looking person, of from forty to sixty, sits down to dinner with a good appetite. He eats three times as much as his body requires, and he excites the stomach to digest it by drinking stimulating fluids to six times the quantity that is necessary. All this, moreover, is done in a close and overheated apartment. The vital turgescence and expansibility of the capillaries and veins are excited to the utmost; the whole surface is full and plump, and the extremities even swollen. Now, a person thus circumstanced, particularly from four to eight or more hours after such ingurgitation, actually has the quantity of his circulating fluids increased from one sixth to one third, at a moderate calculation: but the increase is generally soon diminished by the pulmonary exhalation; the urinary, the perspiratory, and intestinal secretions; which are all greatly augmented, and are thus the safety valves of the circulation. But how often, notwithstanding, do we observe the vessels at last yield before the mass which distends or overloads them, and apoplexy, and various other hæmorrhages and congestions, result; particularly when any one of these safety valves are obstructed or tardy in their action — when the nervous or vital influence is either depressed or much exhausted by the previous excitement, and the vessels are irritated, or their actions otherwise changed by the state of their contents.

17. That plethora is a not infrequent result of amputations cannot be disputed, although the privation of sufficient exercise, which is thereby occasioned, will partly account for the occurrence; at the same time we generally observe that the same quantity of food is taken, and the same quantity of blood is prepared for the body, when deprived of one fourth part of the structures requiring support, as was provided for its nourishment when it was in a state of integrity.

18. That plethora may exist in conjunction with deficient vital or nervous power, and that, although the quantity of blood in the system may not exceed that of health, and yet be too great for this power to control, cannot be doubted. We are constantly observing such pathological conditions, both at the commencement and in the progress of disease; and frequently remark their influence in its advanced states and terminations. (See article CONGESTION.)

19. The *causes* of plethora are so manifest as scarcely to require enumeration. They may operate either singly or in conjunction. They consist, 1st, Of the introduction into the vascular system of a greater quantity of the nutritious elements than is necessary to the support of the organisation; and, 2d, Of the retention in the blood of those parts which are usually removed by the secreting and excreting organs. It must be evident that the former is owing to excess of nourishment and stimulating fluids; whilst the latter proceeds most commonly from insufficient exercise, suppressed natural secretions and excretions, or accustomed morbid discharges. How remarkably the habits, indulgences, luxuries, and

refinement of modern life contribute to these, is sufficiently apparent. At the same time it should not be overlooked that there are certain constitutions, and particularly those of a lax fibre, more disposed to plethora than others, even independently of temperament; that this disposition is often hereditary; and that it is frequently so strong, notwithstanding precautions to overcome it, as to constitute a distinct diathesis. Plethora, particularly in conjunction with a rich state of the blood, is generally most remarkable in those who live highly, drink much, and are very often out in the open air, without taking active exercise.

20. There are also certain epochs of life at which it is most apt to occur, particularly when the energies of life are beginning to wane, and when the balance between sanguifaction and secretion preponderates in favour of the former. (See article Age.) Plethora is also more frequent in females than in males, owing to their more sedentary occupations, and to the wants of the female economy, particularly during the period of utero-gestation, and subsequently to the cessation of the menses. It is justly remarked by various writers, that the plethora of early life is generally arterial and capillary; that of advanced age altogether venous.

21. Plethora has been too generally considered as always existing in fat persons, and as occurring at least in them most commonly. But obesity is no sure criterion of plethora; it may even coexist with a deficiency of blood. I have known the supposition, that obesity indicated at least a sufficiency of this fluid, lead to dangerous results. Indeed, the opinion entertained by several of the older writers, that fat persons do not bear depletion, is quite as well founded as its opposite. There are other circumstances besides this which must be taken into consideration, when we estimate either the simple existence of plethora or its extent. This state of the vascular system is sometimes associated with leanness; but when this is the case, the pulse is also full and strong, and the veins very large, full, and rapidly filled upon being emptied by friction. It is more generally observed in persons passing middle age, who, with a ruddy, flesh-like, or lively surface, are beginning to assume greater fulness of the frame without loss of firmness; and in whom the pulse is full and the veins well marked.

22. *Symptoms.* — Plethora, in its slightest grades, is generally productive of little inconvenience. There are usually observed merely a greater disposition to sleep than in health; less quickness and aptitude to mental or corporeal exertion; and a more marked disposition to suffer from and to be affected by the more energetic causes of disease. In an advanced degree it occasions lassitude, indolence, vertigo, or weight or pain of the head; heavy, snoring, dreamy, and often unrefreshing sleep; turgescence of the countenance, suffusion of the eyes; fulness of the veins, and of the pulse; occasionally palpitations of the heart, and slight amaurosis. Such are the usual signs of plethora, short of actual disease, at least of such as may alarm the patient. When it proceeds further, it assumes either the features of inflammatory fever, with excess of action in some organ or part, or passes into general visceral congestion, according to the states of vital action and power. It may moreover occasion, or *terminate* in, hæmorrhage, visceral inflammations, congestions, and obstructions, active dropsy, morbidly increased secretions, convulsions, spasmodic diseases, morbid states of the vessels, &c.

23. *B. Local plethora.* — The vessels of an organ or part may be loaded with blood, and yet the state of their vital action may be neither generally or locally exalted to the pitch of active determination, nor reduced so low as that of passive congestion. There are, perhaps, few such cases that are entirely independent of some degree of excitement, arising either from the condition of the nerves of the organ, or from an irritating cause of some description influencing the state of the capillaries. The best exemplifications of this state are the plethoric states of the ovaria and uterus previous to the menstrual discharge; of the generative organs during the venereal orgasm; of secreting glands and parts when their functions are unusually active; of the brain during the exciting passions and emotions (see *Local determinations of Blood*), and various internal viscera, particularly the spleen, during the cold stage of an ague, &c. These last, however, more nearly approach to congestion than to simple local plethora. It should not be overlooked, that whatever excites the nerves and irritates the tissues of a part, will occasion turgescence of the capillaries, increased flux of blood through the arteries supplying them, and a quicker return of this fluid through the veins. If the part thus excited perform secreting functions, these will be augmented; and thus increased flux and local plethora will both exist, and constitute local determination of blood, — a state which will be considered hereafter. But still this is not inflammation; for as soon as the cause of excitement ceases, this state disappears, without terminating in any of the ways in which inflammatory action terminates, and without having assumed any part of the formative process which in some state or other follows upon inflammation occurring in a previously sound frame. It cannot, however, be denied, that although local plethora does not constitute either inflammation or passive congestion, it will often favour the production, not only of these, but also of hæmorrhages, convulsions, &c., according to its seat and extent, the state of vital power, the nature of the exciting causes, and other contingent circumstances. It is evident that local plethora may occur either with or without general plethora. It may even coexist with insufficiency of blood (§ 34.).

24. *C.* The *treatment* of general and local plethora consists almost entirely of avoiding its causes. Simple plethora does not require, and is seldom permanently benefited by, vascular depletion alone; indeed, it is more generally increased after a time by this practice, unless more efficient measures be also employed. Abstinence, and a free state of the secretions and excretions; active and regular exercise; abridging the period of repose; early rising; a moderate use of diluents, and abstaining entirely from malt and spirituous liquors; cooling and acidulous beverages, when thirst requires to be quenched; are the chief means both of prevention and cure.

Bibliog. and Refer. — *Galen*, De Plenitudine, *vide* Opera. *Fischer*, De Plethora Mult. Morb. Causa. Erf. 1723. — *Hoffmann*, De Plethora insufficiente Morborum Causa, Opp. sup. ii. pp. 1. 506. — *Stahl*, Theoria Medica Vera,

Juncker's ed. Halæ, 1737. pp. 303. 483, &c.; et De Plethora. Erf. 1736. — *Juncker*, Conspectus Medicinæ. Halæ, 1724, p. 7. *et seq.* — *Nicolai*, De Singular. quibusd. ad Polyæmiam Spectantibus. Jenæ, 1790. — *Rudolsteller*, De Morb. ex Abundantia Sanguinis oriundis. Helms. 1777. — *Weickard*, Vermischte Schriften, b. iii. p. 89.—*Gregory*, Conspect. Med. Theoret. ed. vi. p. 152. — *Horn*, Beiträge zur Medic. Klinik. vol. ii. p. 88. — *Calemard Lafayette*, Essai sur la Plethore ou Polyémie, 4to. Paris, 1809. — *Vaidy*, Dict. des Sciences Méd. t. xliii. p. 178. — *Parry*, Elements of Pathology, 2d ed. p. 30. ap. — *Rochoux*, Dict. de Méd. t. xvii. p. 123.

III. Local Determination of Blood.

Syn. *Afflux of Blood; increased Momentum of Blood.* *Fluxion*, Fr.

Classif. Pathology. Therapeutics — (*Derivation, Revulsion*).

25. *The determination of a larger proportion of the circulating fluid to an organ or part, than is usually sent to it in health,* not infrequently takes place independently of inflammation. This state of the local circulation has been, singularly enough, doubted by some writers, and too much insisted on by others, more particularly by Dr. Parry, who assigned to it a greater importance in pathology than it is entitled to, and overlooked the fact that it is a part only or link in the chain of morbid causation.

26. i. Pathological Doctrine. — *Determination of blood* is intermediate between inflammation and local plethora. *Inflammation* is an actively morbid state of the capillaries; *congestion* a passive condition of both them and the veins; whilst *determination* is a simply active or excited, but not otherwise diseased, state of both the arterial branches and the capillaries, the veins being unaffected, and readily returning the blood conveyed by the arteries. More or less determination of this fluid accompanies acute and sub-acute inflammations, and hæmorrhages; but it never attends congestion, unless this state pass into either of the former diseases, or be followed by augmented secretion from the congested organ. *Local plethora* (§ 23.) is a lower grade of local determination, or rather an intermediate state of the vascular system between determination of blood and congestion. In other words, (*a*), *Congestion* of blood is repletion of the veins, attended by depressed vital power — (*b*) *Local plethora*, increased fulness of the vessels generally, with integrity of vital power — (*c*) *Local determination*, augmented circulation and vital functions of the vessels — and (*d*) *Inflammation*, an actively morbid state of the vessels, and organic nerves supplying them, tending to change of structure and to disorganisation. As these pathological states are often referred to, and are sometimes improperly confounded, it is therefore necessary to attend to the distinctions now drawn.

27. That determinations of blood actually occur, and may even be excited at pleasure for a short time, are matters of daily observation even in health; and that such changes in the circulation of a part are occasioned by the influence of the nerves, particularly of the organic nerves supplying the vessels, seems an equally well established fact. When these nerves are excited, whether by heat, stimuli, friction, or irritating bodies, the capillaries experience a degree of expansion, — a property with which they are naturally, or rather vitally endowed. The erythism, expansibility, or slight erectility, which is evinced by the capillaries of certain organs in a very remarkable manner, exists more or less throughout the frame, especially in mucous or cellular parts. When, therefore, this property is influenced by any agent possessed of the power, the diameter of the capillaries running between the arteries and commencement of the veins being increased, an enlarged stream of blood will necessarily pass through them, and a correspondent demand will be made upon the arteries supplying them, owing to the less resistance opposed to the current, and freer circulation in the part thus circumstanced, provided that the return of blood by the veins be not impeded. If the circulation be thus increased as respects the volume of blood passing through the vessels, and continue thus facilitated, the demand thereby made upon the larger vessels and the heart will ultimately tend also to accelerate it; and hence will result augmented volume and quickened circulation — the states constituting determinations of blood.

28. The circulation of an organ or part may long remain in this state, particularly if its vital manifestations do not become exhausted, and if its nervous power continue excited by the agent or cause which first occasioned this condition, or by other influences operating in a similar manner. But if the vital or nervous power become depressed, or otherwise changed, either congestion, or some form of inflammation, will generally ensue, or even hæmorrhage may take place, — a result which is not infrequent when the determination takes place to membranous viscera or parts, and to mucous surfaces. These being, therefore, not unusual terminations of simple determination of blood, means should generally be employed to remedy this state. The agent or cause exciting the vessels should be removed, and other measures directed that may equalise the circulation and diminish its fulness, when the determination is connected with plethora, as it not infrequently is.

29. Determinations of blood to an organ are very frequently occasioned by whatever rouses its natural actions. If the part thus excited perform secreting functions, the increased secretion, in addition to whatever excitement of the vessels may be produced, will of itself determine a greater flow of blood to it. Numerous proofs of this are furnished us by the progress of various diseases, and the appearances presented by others after death; and, endeavouring to follow nature, we attempt to remove determination or inflammations in vital organs, by inducing artificially an afflux of blood to parts and surfaces where it cannot be injurious, as to the skin, mucous digestive surface, extremities, &c., with the view of assisting other agents in soliciting or recalling it from the seat of disease. The exercise, also, of organs which possess not secreting functions, will likewise favour an augmented flow of blood to them. Thus, exertion of the mental faculties and the passions determine an afflux of blood to the brain; and of the muscular organs, to the spinal chord, muscles, and heart. It is of importance to be aware that the irregular distribution of the blood, whether of this or of other kinds, may take place either when this fluid is more abundant and richer than natural, or when it is deficient as well as poor; and that the change from the healthy state of the circulation is to be imputed primarily to the state of influence exerted by the organic class of nerves distributed to the vessels, which, thus influenced,

control the volume of the blood circulating through them (§ 27.), as well as modify its states and the rapidity of its circulation. The particular determinations of blood are noticed in their respective articles.

Bibliog. and Refer. — *Stahl*, De Commotionibus Sanguinis Activis et Passivis. Halæ, 1698. ; et De Motu Sanguinis et pendentibus Vitiis, &c. Halæ, 1709. — *Fischer*, De Motu Sang. Naturali, Non-naturali, et Mixto. Erf. 1720. — *Barthez*, Mémoire sur les Fluxions, qui sont les Elémens essentiels dans divers Genres des Maladies, in Mémoires de la Société Méd. d'Emulation, t. ii. p. 1. — *Parry*, Elements of Pathology and Therapeutics, 2d ed. Lond. 1825. — *Author*, in Lond. Med. Repos. vol. xxiii. p. 409. — *Barry*, Exp. Researches on the Blood. 8vo. Lond. 1826.

30. ii. Therapeutical Doctrine. — *Derivation* — *Revulsion.* The doctrine of determination of blood sufficiently indicates the propriety of having recourse to means in the cure of various diseases, calculated to solicit a flow of blood to parts where this may be done safely, and thus to diminish the quantity sent to the seat of disease. This mode of practice was well understood, and very generally employed by the older physicians, upon the well-known pathological principle that "*ubi irritatio, ibi fluxus.*" It must not, however, be overlooked that *irritation* will not always procure afflux of blood; and that it is therefore not altogether identical with *derivation*, either in a pathological or a therapeutical point of view. It does not come within my limits to point out the difference; but they are so far alike, that, in order to produce the latter, we frequently have recourse to the former. At the same time we must recollect that irritation will sometimes be of service even independently of any afflux of blood that may accompany it, or even although it should fail of producing this effect.

31. It is almost unnecessary to enumerate the means, which we occasionally have recourse to in order to occasion a local determination of blood, and thus derive it from the seat of disease. These consist of numerous agents: — *a*, Such as increase the circulation in the rete mucosum, as rubefacients, sinapisms, external heat, &c.: *b*, Those which, in addition to augmented circulation, procure a discharge from the surface or part to which they are applied, as scalding water, blisters, irritating ointment, &c., purgatives and cathartics, &c.: *c*. Those which, by procuring a flow of the natural secretions, solicit an afflux of blood to the secreting organs, as certain purgatives, diuretics, and diaphoretics: *d*. Those which evacuate the viscera, increase the discharges from their mucous surface, and augment the secretions in adjoining organs, as emetics, cholagogue purgatives: *e*. Those which influence the circulation in the limbs and extremities, as frictions, the semicupium, various forms of pediluvia and manuluvia; abstraction of blood from the *feet* or *hands*, by venesection, leeches, or cupping; stimulating or scalding pediluvia, &c.: and, *f*. Those which permanently irritate and procure a continued discharge, as deep scarifications, incisions, setons, issues; caustic applications, as the alkalies, the inner bark of mezereon, moxas, &c.

32. All these occasion, in the first place, irritation in the part to which they are applied, and, consequent to this, an afflux of the circulating fluid. Some of them produce the primary, more remarkably than the secondary effect; and when this is the case, the pain which is felt is often an index of the extent of the former. This is the case with blisters, rubefacient epithems, sinapisms, and scalding applications; and therefore much advantage is obtained from them in various diseases, independently of their secondary operation, particularly when we wish to rouse the torpid or oppressed functions of an adjoining or subjacent organ. When derivation is, however, our principal object, they cannot always be depended upon, particularly in irritable habits, and in the early stages of acute diseases. They ought never to be employed in the stage of excitement in fever, unless this stage be irregular, imperfectly developed, or inefficient; nor in inflammations, until acute action is subdued by depletions, evacuations, and other means, — when only artificial derivation can be expected to have any influence in diminishing the remaining disorder, and lessening the risk of effusion. This caution is especially deserving of attention in respect of blisters, — the cantharides of which, particularly if improperly allowed to remain too long on a place as they often are in diseases of excitement, being often absorbed into the circulation, thereby increasing the general as well as local vascular action. These applications, also, ought not to be directed to the vicinity of parts suffering from vascular excitement. I have often seen mischief produced by blisters having been directed to the head and throat in acute diseases of the subjacent parts.

33. The means usually employed in order to derive the flux of blood from diseased parts are variously combined, and much discrimination is requisite both in the choice and in the combination of them, appropriately to the state and nature of the diseased action at the time. The scope and limits of this work preclude my entering upon this important branch of the subject; but it has received attention when discussing the treatment of those diseases in which the various means of derivation are required: and the appropriation of those means to the different states of vascular action is there attempted with some degree of precision.

Bibliog. and Refer. — *Dumas*, Nova Constitutio Artis Revellendi et Derivandi per Venæsectionem, 4to. Tig. 1557. — *Sennert*, De Revulsione et Derivatione, 4to. Vit. 1604. — *Bohn*, De Revulsione Cruenta, 4to. Leip. 1704. — *Fildar*, De Revulsione. Lugd. Bat. 1731. — *Segner*, De Derivatione per Venæsectionem. Goet. 1749. — *Bolten*, De Revulsione Generatim. 4to. Halæ, 1750. — *Mrazer*, De Lege Revulsionis Virium Systematis Nervosi. Pragæ, 1784. — *Gericke*, Derivationis et Revulsionis Histor. et Præsid. 4to. Jenæ, 1787. — *J. H. F. Autenrieth*, Observationes Veritatem Methodi Revulsoriæ Spectantes, 8vo. Tubingæ, 1802. — (Recommends the tart. antimonial ointment, the first employment of which has been incorrectly attributed to Dr. Jenner. It was first recommended by the late Dr. Monro, in his Lectures on Morbid Anatomy. I attended these lectures, and employed it long before the publication of Dr. Jenner's letter on the subject. See cases adduced by me illustrative of its good effects, in London Med. Repos. vol. xvii. p. 310.) — *Pinel* et *Bricheteau*, in Dict. Sciences Médicales, t. xlviii. p. 384. — *Jenner*, Letter to *C. H. Parry*, on the Influence of Artificial Eruptions in certain Diseases, &c. 4to. Lond. 1822.

IV. Deficiency of Blood. Syn. *Anæmia* (from the privative *α*, and *αἷμα*, blood). *Bloodlessness.* *Anémie*, Fr. *Der Blutmangel*, Ger. *Dyspepsia Anæmia* (Young). *Marasmus Anhæmia* (Good).

Classif. 3. *Class*, Diseases of the Sanguineous Functions; 4. *Order*, Cachexies (*Good*). I. Class, V. Order (*Author*).

34. Defin. *A deficiency of blood in the whole*

body or in some important organ, not proceeding from natural or artificial hæmorrhage, giving rise to a waxy, bloodless state of the countenance and surface, emaciation, feeble quick pulse, and great languor and debility.

35. Defect of blood, bloodlessness, or anæmia, althought not of frequent occurrence, is yet occasionally met with, particularly in its less remarkable, or local forms. In connection with *chlorosis* it is oftener observed. Cases of anæmia have been recorded by REISELIUS, SWHENKE, and others; and the disease fully described by BECKER, ALBERT, JANSON, HOFFMANN, DE HAEN, ISENFLAMM, LIEUTAUD, HALLÉ, ANDRAL, and several pathologists and practical writers of the present day. I shall first offer a few general observations on local anæmia; and afterwards describe more fully general anæmia and its complications. The deficiency of blood, occasioned by natural or artificial losses of it, is considered under a distinct head.

36. i. PATHOLOGY OF ANÆMIA. — 1st, *Local anæmia.* Deficiency of blood in an organ or part is evidently the result of one or more of the following pre-existing lesions: — *a*, Of diminished influence of that portion of the ganglial or organic class of nerves which supplies the blood-vessels of the organ; *b*, Of defective vital expansion of its capillaries, probably owing to the depressed state of the influence exerted on the vessels by the nerves supplying them; *c*, Of mechanical impediments in the way of a sufficient supply of blood; *d*, Of imperfect developement, or diminished calibre of the arteries by which blood is conveyed to the organ; *e*, Of disease of the organ or part, or an imperfect exercise of its functions; and, *f*, Of unusual flux of blood to other quarters, causing a proportionate diminution of it in others. It is evident that these states are merely local, and are capable of co-existing with other changes affecting the whole mass of the circulating fluid, as respects both its quantity and its quality; and that various disorders of function, according to the particular state on which the anæmia depends, and the extent to which it may exist, will be the consequence.

37. The organs most subject to this condition of their circulation are, according to M. ANDRAL, the lungs, the brain, the liver, the substance of the heart, the stomach and alimentary canal, and some of the voluntary muscles. To these I would add, the spleen, the ovaria, and the generative organs of the male. In many of these, as in other parts, atrophy is associated with the anæmia; and may be considered, in the majority of cases, as the consequence of it. The *symptoms* of local anæmia are not always manifested during life; but they frequently are, as I shall have occasion to point out, when considering the morbid conditions of those organs most subject to this change. Thus, in the completest of all the states of local anæmia, as when the obliteration of an artery cuts off all supply of blood to the organ, gangrene will result; frequently, when anæmia is seated on the brain, a form of convulsion is the consequence, with other symptoms stated in the article on this subject (see BRAIN — *Anæmia of.*); and when the ovaria, at the period of puberty, is not supplied with the requisite quantity of blood, owing to deficient influence of the ganglial nerves distributed to the organs of generation, chlorosis, sometimes with more or less of general anæmia, is the constant effect.

38. 2d. *General anæmia.* — The blood circulating through the body may be most remarkably deficient, in respect both of its quantity, and of the relative proportion of red particles. In many cases in which the absolute quantity of blood in the body is diminished, the globules are still more remarkably deficient, they being insufficient to give the blood its usual deep colour. General anæmia presents itself in practice, 1st, as a primary disease; 2d, as a consequence of pre-existing lesions of some one of those organs which are concerned in conveying the nutritious fluids into the blood, or in the processes of sanguifaction; 3d, associated with other diseases, resulting equally with it from some antecedent affection, the nature of which cannot, perhaps, be readily recognised.

39. *A.* The *primary forms* of anæmia, when closely analysed, seem to proceed, 1st, from deficient nourishment; 2d, from deficient vital power, — from a torpid or depressed state of the influence of the organic class of nerves on the digestive, assimilating, sanguifying, and circulating organs which they supply. — *a.* The influence of deficient supply of nourishment in producing anæmia may be readily imagined, and instances showing it are numerous; I will merely allude to one: — M. GASPARD, whose researches have tended much to advance the state of the pathology of the fluids, has illustrated this part of the subject by observing the remarkable degree of anæmia which existed in a large proportion of the inhabitants of a district devastated by famine, who lived upon grass. A more common and less expected form of general anæmia is that which arises from the injudicious restriction of diet and regimen, during convalescence from acute diseases, particularly those which have required large depletions. Several instances of this state of disease have come before me, and would, I am confident, have terminated in dropsical effusions (§ 44.) or in death, if a different system had not been adopted.

40. *b.* A torpid state of the organic class of nerves, in one of the most influential, if not the most frequent, antecedent affections to which we can impute this state of the circulating fluid. It is extremely probable that those instances of its occurrence from being shut out from the sun's influence, and the constant respiration of an unwholesome air, arise from the continued privation of salutary stimuli to this important class of nerves, upon which the sanguifying processes depend.

41. The influence of the *sun's rays* in promoting all the vital actions, particularly those of organic life, probably from modifying the electromotive state of the frame, must be evident to all. The good effects of light and air are shown in the vegetable kingdom, the circulating fluids of which cannot be duly formed without exposure to both. The sun's rays diffuse a genial influence through the frames of the aged, and excite the organic and generative functions of the young. It has been observed that those persons who are entirely excluded from the light of the sun, and breathe the *close air of mines*, are particularly subject to general anæmia. M. CHOMEL has given a very interesting account of the disease which

affected the workmen employed in a coal mine at Auzain. It commenced with colicky pains, meteorismus, blackish green stools, dyspnœa, palpitations, great prostration of strength, followed, in ten or twelve days, by a yellowish or waxy and bloodless appearance of the countenance. The capillary vessels disappeared from the conjunctiva and mucous surface of the mouth; and the pulsation of the arteries could scarcely be felt. The patients complained of palpitations, anxiety, oppression and suffocation on exertion, paroxysms of fever, profuse perspirations, œdema of the countenance, and rapid emaciation. This state continued for six months or a year; and in some cases terminated fatally, with the reappearance of the invading symptoms. Four of these patients were sent to Paris for treatment, and were ordered light nutritious diet, bitter infusions, &c. One of them died; and on dissection, the arteries and veins were found almost void of blood, containing merely a little sanguineous serum; and little or no blood flowed from the parts divided during the inspection. The appearances in this case led Mr. Hallé to prescribe iron filings in the dose of a drachm daily, with tonics and opium; and, under this treatment, all the symptoms gradually vanished, the capillary vessels reappearing on the surface.

42. *B.* It is probable that general anæmia will not take place, unless *consecutively* of remarkable torpor of the vital influence, or of some other morbid condition of one or more of the organs which contribute to the formation of blood. Where the digestive powers and the functions of the liver are weakened, anæmia to a slight degree is not infrequent. Its connection with chlorosis is merely that of an associated effect of pre-existing depression of the influence of the sytem of organic nerves. (See Chlorosis.) The lungs have been considered by some authors as the organ which is chiefly concerned in the production of anæmia, and consequently have been viewed by them as the seat of hæmatosis, or at least the place where this process is completed. Without disputing that such is the case to a certain extent, I am disposed to view the liver as being equally, if not more, concerned in this function, — an opinion long since contended for in my Physiological Notes (see *Appendix to* M. Richerand's *Elements of Physiology*); and consequently as being in many cases very influential in the production of general anæmia. It is probable, however, that other viscera or parts may also give rise to it. Thus it may be admitted that total obstruction of the thoracic duct will occasion it; and I have repeatedly observed it in children affected with various chronic diseases of the viscera of organic life; being here, as in most cases, one of the results of imperfect digestion and sanguifaction, as well as of obstruction to the passage of chyle into the blood. One of the most remarkable cases of general anæmia was recorded by Dr. Combe. In it all the viscera were found nearly bloodless, excepting the spleen; but not diseased in other respects, at least not to the extent of impeding their functions. The thoracic duct and absorbent system were not examined.

43. The *symptoms of anæmia* have been nearly all alluded to in the foregoing remarks. I may, however, enumerate them briefly at this place. They consist of a pale, waxy, or blanched appearance of the countenance and integuments, in which the cutaneous veins are scarcely seen; and those which appear are pale, apparently empty, do not fill quickly, or scarcely at all, upon pressure made upon them; and, when emptied, fill very slowly. The conjunctiva has lost its red vessels; the lips, tongue, and inside of the mouth are pale; the pulse feeble, small, irregular, and readily made still quicker or fluttering upon mental emotion; the patient is languid and very weak; complains of flatulence, borborigmi, and an irregular state of the bowels, with want of appetite, and an occasional nausea; a sense of sinking and syncope, particularly upon assuming the erect posture, followed by palpitations; oppressed, short, hurried, and sometimes gasping respiration; irregular convulsive or spasmodic movements; tremors; œdema of the ancles; and in some cases the more severe symptoms described as following sinking after large depletions (§ 54.) In the more unfavourable cases the patient may be carried off by a fit of syncope upon assuming quickly the erect posture; or by a convulsion; or sink with the symptoms of exhaustion, or with those of effusion on the brain, or in the pleural or pericardial cavities. It most commonly runs into one or more of the complications about to be noticed.

44. 3d, *Complicated anæmia.* — Deficiency of blood, as respects both its diminished *quantity* and its *poor* quality, or the defect of red globules, is often associated with visceral disease, of which it is generally the consequence; but it also may give rise to various affections, both functional and organic. That anæmia should be complicated with certain chronic diseases of the liver, mesenteric glands, and absorbent system, chlorosis, &c. may be expected; but that it should give rise to diarrhœa, and to dropsical effusions in various parts, particularly in the shut cavities and cellular tissue, without any alteration of the solids, may not appear so obvious, although admitting of explanation. M. Andral states, that he has observed anæmia in the bodies of persons who had died dropsical; and in persons who had complained of diarrhœa, profuse perspirations; and very justly considers both the dropsical effusions into the shut cavities and into the cellular tissue, and the exhalation from the digestive mucous surface and skin, as perfectly independent of any local congestion or irritation, and to be analogous to the profuse diarrhœa and perspirations which occur in persons who are brought near to dissolution by long protracted disease. In all such cases, whether attended with effusion into shut cavities or cellular tissue, or with increased exhalation from mucous surfaces, we may consider nearly the same pathological conditions to exist as their principal sources, viz. diminished tone of the exhaling orifices, with lessened vital cohesion of the tissues in which they open; a poor and thin state of the blood, the crasis of which is much lowered; and a more rapid circulation of the remaining fluid.

45. Anæmia, when existing even in a moderate degree, will often give rise to various functional disorders, which are, however, of no constant character, but differing with the temperament, habit of body, &c. The chief of these are hysterical and epileptic convulsions, palpitations, leipothymia or syncope and palpitations alternately, irregular or anomalous convulsions and spasms,

chorea, and various nervous tremors resembling chorea, dyspnœa, sickness or vomiting, œdema of the ancles, diarrhœa, headach, &c., with weak, small, quick pulse; pale, waxy, or doughy state of the countenance; listlessness, flatulent state of the abdomen, gastralgia, colic pains, very weak digestion, vermination, and irregularity of the fæcal and urinal evacuations. It will also be followed by atrophy and softening of several of the internal viscera, and general emaciation.

46. In cases where general anæmia is not excessive, it may be admitted that both inflammation and hæmorrhages may still occur, particularly the latter, from the causes usually producing them; and that they will have a remarkable tendency to terminate unfavourably, owing to the state of the system causing the deficiency of blood, to this defect itself, and to the want of vital resistance, as well as to the incompatibility of most of the means of cure with the state of the constitutional powers and of local action.

47. Causes.—Several of the causes of anæmia have been already alluded to (§ 39—42.). There may be others which have not yet been ascertained. I may state, however, briefly and generally, those which have been usually acknowledged. They consist of insufficient and poor food; excessive secretions and evacuations; masturbation practised early in life, and long continued; long exclusion of the body from the direct influence of solar light and rays; protracted confinement in crowded apartments, in the stagnant and impure air of manufactories, especially when affecting children or very young persons; and the constant respiration of a moist, impure, and miasmal atmosphere, from which the sun's rays are shut out. All these exhaust or depress the vital and nervous powers; whilst some also either cut off the necessary supply to the circulating fluid, or waste its richer constituents. To these causes may be added certain malignant organic diseases, as carcinoma, &c., which, in the latter stages, is always attended with more or less of anæmia; impeded developement of organs, particularly those belonging to the generative functions, whose perfect evolution is requisite to the salutary excitement of all the organic actions, especially those of digestion and sanguifaction; and lesions which either impede these latter functions, and interrupt the passage of chyle into the blood, or vitiate these fluids.

48. Treatment.—The most rational and the most successful means that can be employed consist of such as are calculated gently to excite and permanently to promote the organic functions. Of these, the most appropriate appear to be the various preparations of iron, bark, sulphate of quinine, camphor, ammonia, small doses of iodine, æther, &c. combined occasionally with opium, hyosciamus, extract of hops, conium, &c. when the disease is attended with colicky pains. Conjoined with these, the chalybeate mineral waters, stimulating frictions of the surface, light and digestible food, gentle exercise in the open air, particularly on horseback, and change of air, will be found of much service. During the employment of tonics, due attention should be paid to the state of the secretions and excretions; and, when the bowels are constipated, the more tonic and less irritating aperients be resorted to. Of these, perhaps, the best are rhubarb, and aloes, the aloes and myrrh pill, the compound iron pill, &c.

49. When the state of the system is attended with hysterical, convulsive, and other nervous affections, a combination of tonics and chalybeates, with antispasmodics, as the preparations of valerian, ammonia, zinc, myrrh, extract of hops, galbanum, æther, strychnine, and various others, is indicated. If we have reason to suspect that the anæmia is a consequence of obstruction or of torpor, combined with an enlargement of some organ or part concerned in the formation of blood, the preparations of iodine, the liquor potassæ alone or combined with tonics, the subcarbonate of soda, the boracic acid, and sub-borate of soda, are the best medicines with which I am acquainted.

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V. Morbid Effects of Loss of Blood. — 50. This is a subject of greater practical importance than has generally been attached to it; and one which I have had numerous occasions to contemplate, particularly from the years 1816 to 1828, —an epoch during which blood-letting was either more generally adopted, or carried further, than the nature of several diseases, and the constitutions of many patients, warranted. The effects of large depletions have been well illustrated by the experiments of Dr. Seeds, which have shown, what indeed might have been anticipated from the physical condition of the circulation within the cranium, viz. that we can never hope by depletion alone to materially diminish the quantity of blood in the vessels of the brain. Dr. M. Hall, and the Author, have also shown that several morbid states may be occasioned by large losses of blood, or by too large a proportion of this fluid circulating in the head, relatively to the rest of the body, as a consequence of large blood-letting; and M. Piorry has illustrated the same subject by numerous experiments, and has offered many instructive and practical observations on it, particularly in relation to diagnosis.

51. The *morbid effects* of loss of blood may be advantageously considered in relation, *first*, to a person previously in health, or not affected by dangerous disease; and, *secondly*, to persons labouring under different diseases in which loss of blood may occur, either naturally or from injudicious practice. My observations on both these branches of the subject must necessarily be brief, more particularly on the latter, as the topic is not overlooked in the consideration of the treatment of those diseases in which such losses are most likely to be met with.

52. i. Morbid Effects of Loss of Blood in persons not previously affected with serious disease.—These effects will naturally vary with the suddenness or rapidity of the loss, the extent to which it has proceeded, and the habit of the person, especially as regards vascular plethora, at

the time when it occurred. It is evident that an evacuation which has been rapid will have a more marked and serious effect, than the same quantity removed at several times, or in a slower manner; and that, when blood is discharged at intervals, a much larger quantity may be lost without producing the morbid effects often resulting from the sudden loss of a smaller quantity; or, if they occur, they may be of a different kind from those which follow rapid discharges. The subjects, therefore, which chiefly require consideration are, 1st, The immediate effects of large loss of blood; 2d, The more remote consequences; and, 3d, The slow and insidious effects supervening on repeated losses, each occurring to a small or moderate extent.

53. *A. Of the immediate effects of large losses of blood.* — These are, vertigo, leipothymia or a sense of sinking, syncope; feeble and slow, or sometimes quick fluttering pulse; slow or apparently suspended respiration for short periods, interrupted by deep sighs; eructations from, and sometimes sickness of, stomach; a cold, pale, and bedewed countenance and general surface; irregular sighing and yawning, generally followed by a return of the pulse and of consciousness; and, if the hæmorrhage is not renewed upon the restoration of the circulation, recovery soon follows. Where, however, the loss of blood is greater, the above symptoms are more marked; the syncope is more profound; the respiration, which is carried on during this state entirely by the diaphragm, is nearly imperceptible, until it suddenly returns at intervals, with deep sighs: sickness and vomiting occurs, and restores consciousness for a time, but the patient again relapses into syncope, which is broken in a similar manner; and, if the loss of blood has ceased, a more permanent restoration follows the sighing and sickness, and recovery slowly takes place.

54. When, however, the loss is still greater either absolutely or relatively to the energies of the patient, or if it continue after the above effects supervene, the return of consciousness is often attended with some degree of delirium; a difficult stertorous breathing; dyspnœa; gaspings for breath; occasionally retchings, and discharge of the contents of the large bowels; an irregular, intermittent, feeble, or imperceptible pulse; loss of animal heat; great restlessness, violent shudderings, or general tremors, and jactitation, sometimes so violent as to shake the bed upon which the patient lies; a sense of sinking through the floor; convulsions, or tetanic spasms, and contractions; terrible gaspings for breath, and death.

55. Such is the common grouping of the morbid effects; but some of them are more marked than others. Thus, when the loss of blood is very large, the patient may suddenly and unexpectedly expire in one of the fits of syncope which occur, or he may sink more gradually, without any appearance of delirium or convulsion, sometimes with the faculties entire to the last. The former may occur after excessive blood-letting or hæmorrhage, when the patient has been incautiously raised up, or when he has not been instantly placed in the recumbent posture when syncope occurred: the latter has taken place unexpectedly when blood-letting has been carried too far, or too often repeated, in the recumbent posture.

56. *Convulsions* are often the most marked effect, either of excessive hæmorrhage or of large and repeated venæsection in the recumbent position; particularly if it be carried to leipothymia or syncope in this position, which ought always to be avoided. This symptom is very common after puerperal hæmorrhagy, or any large losses of blood occurring in females, particularly those of an epileptic or hysterical diathesis, and in children or young subjects.

57. *Delirium* is another prominent effect of excessive evacuation of the vascular system; but it usually presents something peculiar. The carotids are often neither full nor strong, the countenance is pale, and the head cool, — symptoms indicating, with the character of the delirium, impaired vital energy of the brain. In some cases the delirium is associated with convulsions, and both may ultimately be followed by coma or lethargy. Delirium more rarely occurs in children or young subjects from excessive loss of blood, than in adult or advanced age; but coma, as will be shown hereafter, is not infrequent in the former, particularly when the loss of blood has occasioned convulsions, which in them usually terminate in coma.

58. *B. Of the more remote effects of large loss of blood.* — When the patient is not carried off by the more immediate effects of excessive loss of blood, reaction generally supervenes, and often becomes excessive. It usually commences with palpitations, and throbbings through the body, but particularly in the carotids and arteries of the head, giving rise to the peculiar noises, of which patients so often complain after large depletions. The pulse now becomes quick, sharp, and soft; and there is sometimes distressing nervous pulsation of the aorta. In the more marked cases of reaction, the patient complains also of pain of the head; intolerance of light and of noise; a sense of tightness or pressure around the head; hurry of mind, and sometimes delirium, particularly in the night; restlessness, agitated sleep, often accompanied with a sense of sinking or impending dissolution, fearful dreams, &c. The arteries throb; and the pulse ranges from 110 to 140, is jerking, sharp, open, and bounding, but readily compressed. The respiration is hurried, panting, and frequent; often attended with sighing, a desire of fresh air, great restlessness, and in females for aromatic perfumes, or the smelling bottle. The mouth and throat are dry; there is much thirst; and the skin is usually hot, but the extremities, particularly the lower, are generally cold.

59. This state has not infrequently been mistaken for one requiring depletion; and I have met with cases in which the idea of inflammatory action had so taken possession of the mind of the practitioner, as to induce him to employ large or repeated depletion, which had been followed by this state of reaction, for which he was proceeding again to deplete, mistaking the morbid effects of the previous excessive loss of blood for a return of the inflammation. If this state of reaction be not judiciously managed, exhaustion rapidly supervenes; and almost as soon as it occurs death may take place, frequently upon some muscular effort, or upon getting up from the recumbent posture. In some cases, particularly in children and young subjects, the delirium or morbid sensibility of the brain, characterising the reaction,

passes rapidly into a state of lethargy and coma, which on numerous occasions I have seen mistaken for effusion of serum within the cranium, or hydrocephalus, particularly when it has been preceded by convulsions, as is often the case in children. In many such cases, either no effusion is found, or the effusion is to an extent insufficient to account for the comatose symptoms.

60. Under more favourable circumstances the reaction is gradually followed by returning health, or lapses into a state of chronic exhaustion or asthenia, which is variously characterised. In some cases it is attended by somnolency, alternating with slight delirium, &c.: in others, by fits of dyspnœa, palpitations, frequent cough; hurried, laborious breathing; a flatulent, tympanitic state of the abdomen: in several, by pale, emaciated, or discoloured countenance and skin; amaurosis, nervous tremors, or jactitation; delirium, or mania: and in puerperal females by a form of mania which requires to be carefully distinguished, and which is particularly noticed under the article on *Puerperal Mania*. In addition to these functional disorders following reaction after large losses of blood, organic changes may supervene; such as effusion of serum and extravasation of blood upon the brain, effusion into the bronchi and air-cells, dropsical effusions in various parts, and flatulent distension of the stomach and bowels. When recovery takes place, the pulse always continues small and frequent for a long time, owing to the remarkable diminution of the fluid in the vessels.

61. C. *Of the insidious effects produced by small but often repeated losses of blood.* — Loss of blood occurring in this manner produces effects different from those now described. They generally, as may be expected, advance slowly, and often exist either altogether, or a long time, without detection. They are extremely various, according to the age and constitution of the person. They most frequently occasion a pale, leucophlegmatic, and lax appearance of the countenance and surface; a very quick, weak, and irritable pulse; hurried, and oppressed respiration; frequent palpitations, and sense of sinking; borborygmi, and hysterical symptoms; flatulent distension of the colon, and colicky pains; swellings of the ankles, and dropsical effusions in other parts: in females, difficult and scanty menstruation, chlorosis, deviations of the spinal column, epileptic convulsions, pains in the loins, and various anomalous affections of a painful or spasmodic kind; tremors, and irregular action of muscles; chorea; paralysis; dyspeptic disorders, with irregularity of the bowels; a disposition to syncope; amaurosis; and all the symptoms of anæmia, which indeed is the primary or real state of disease produced, and constitutes the chief change detected upon examination after death; together with serous effusion in some situations, and a pale bloodless state of the viscera, and of the heart itself.

62. ii. OF EXCESSIVE LOSS OF BLOOD IN THE COURSE OF VARIOUS DISEASES. — There are two important considerations which should not be overlooked in practice; viz. that in many diseases, apparently attended with excitement, we shall meet with cases in which the actual quantity of blood in the body is much less than usual; and in various others, blood-letting will often not be borne, although seemingly indicated, and although the quantity of blood in the frame be not lessened. In illustration of the former of these, I may state that many years ago I had an opportunity of remarking minutely the appearances on dissection of a man of middle age, and somewhat fat, who had complained of an acute and painful disease, obviously functional, for which he had been blooded only twice on successive days, and on neither occasion to above thirty ounces; and yet the symptoms of excessive loss of blood appeared, from which he died in twenty-four hours after the second depletion. The most careful examination could detect no organic change, excepting the remarkably bloodless and pale state of all the viscera. Even the brain was less vascular than usual. That in various diseases, unattended by diminution of the circulating fluid, depletion will produce marked symptoms of depression and sinking, owing to the state of the vital power being insufficient to accommodate the vessels, by their tonic or vital contraction, to the reduced bulk of the blood, is well known, and has been fully discussed in the articles on *Adynamic Fevers*, *Erysipelas*, and *Puerperal Fevers*; in which, as well as in puerperal mania, and various other acute diseases, large vascular depletion is often most injurious.

63. *A. Of excessive loss of blood in diseases of excitement.* — The morbid effects of large depletions will necessarily vary with the nature of the disease in which they are employed. When carried too far, in cases of excitement, where the nervous or vital power is not depressed, and the blood itself rich or healthy, reaction generally follows each large depletion, and thus often exacerbates or brings back the disease for which it was employed, and which had been relieved by the primary effects of the evacuation. This is more remarkably the case in acute inflammations of internal viscera, particularly of the brain or its membranes. Thus, every observing practitioner must often have noticed, that a large depletion, when carried to deliquium, will have entirely removed the symptoms of acute inflammation when the patient has recovered consciousness; and that he expresses the utmost relief. But it generally happens that the inordinate depression — the very full syncope that is thought essential to the securing of advantage from the depletion — is followed by an equally excessive degree of vascular reaction, with which all the symptoms of inflammation return; and the general reaction is ascribed entirely, but erroneously, to the return of the inflammation, instead of the latter being imputed to the former, which has rekindled or exasperated it, when beginning to subside. The consequence is, that another very large depletion is again prescribed for its removal; and the patient, recollecting the relief it temporarily afforded him, readily consents. Blood is taken to full syncope — again relief is felt — again reaction returns — and again the local symptoms are reproduced: and thus, large depletion, full syncope, reaction, and the supervention on the original malady of some or all of the phenomena described above as the consequence of excessive loss of blood, are brought before the practitioner, and he is astonished at the obstinacy, course, and termination of the disease; which, under such circumstances, generally ends in dropsical effusion in the cavity in

which the affected organ is lodged; or in convulsions, or in delirium running into coma; or in death either from exhaustion or from one of the foregoing states; or, more fortunately, in partial subsidence of the original malady, and protracted convalescence. Such are the consequences which but too often result — which I have seen on numerous occasions to result, when blood-letting has been looked upon as the only or chief means of cure — the "*sheet anchor*" of treatment, as it too frequently has been called and considered during the last twenty years.

64. *B. Of the mode by which excessive loss of blood in disease may be best avoided.— Method of conducting blood-letting.* From the above it will appear obvious, that if blood-letting were better managed, and directed so as to make an impression on the local ailment, but in such a manner as to avoid being so readily followed by the reaction which reproduces the malady for which it was employed, great advantage in practice would result, and much less blood require to be removed even in the most acute cases. *a.* In order to accomplish this, I have long been in the habit, — and have inculcated it in my lectures on the practice of medicine, from 1824, — of directing the following mode of practice when large blood-lettings were required in the treatment of visceral inflammation: — The patient should be either in bed, or on a sofa, and in the sitting or semi-recumbent posture, supported by several pillows. The blood is to be abstracted in a good-sized stream, and the quantity should have some relation to the intensity and seat of the disease, and the habit of body and age of the patient, but chiefly to its effects; it should flow until a marked impression is made upon the pulse, and the countenance begins to change. Further depletion must not now be allowed; but the finger should be placed on the orifice of the vein, the pillows removed from behind the patient, the recumbent posture assumed, and the arm secured. Thus a large quantity of blood may be abstracted, when it is required, without producing full syncope, which should always be avoided; and when a large loss of this fluid is either unnecessary, or might be hurtful, the speedy effect produced upon the pulse and countenance by the abstraction of a small quantity will indicate the impropriety of carrying the practice further. In this manner I have often removed about forty ounces of blood, where large depletion was urgently required, before any effect was produced upon the pulse, but always carefully guarding against syncope; and by the subsequent means used to prevent reaction, no further depletion has been required.

65. *b.* In order, however, to obtain this object, a treatment varying with the nature of the disease is required. Repeated doses of tartarized antimony, either given in small quantities at very short intervals, or in large doses, combined with opium; full doses of calomel, antimony, and opium; of camphor, nitrate of potash, and colchicum; or of ipecacuanha, nitre, and opium, &c., particularly the first of these, exhibited so as to excite nausea, but guarding against retching as being liable to induce reaction; and the individual antiphlogistic remedies, appropriately directed, and combined according to the circumstances of the case, are the chief means which I have employed to prevent the return of increased action after blood-letting conducted as now stated. The particular measures which may follow blood-letting are fully explained in the articles on *Inflammation of the different Organs*; but I may now mention, that when opium is given with the view of preventing the recurrence of reaction, it ought to be exhibited in a large dose at once, (two or three grains,) either with a full dose of James's powder, or any other antimonial, or with two or three of ipecacuanha, conjoined with some one of the other substances above mentioned.

66. It should be kept in recollection, however, that reaction after large depletions is chiefly apt to occur in idiopathic inflammations, and other diseases of excitement, in which the constitutional or vital powers are neither remarkably lowered nor depraved; and when the circulating fluid is not vitiated by the retention of those substances in it which require to be eliminated, nor by the absorption of matters which are foreign to its nature, and injure its purity. Reaction is very apt to follow large losses of blood in acute rheumatism; in inflammations of the membranes of the brain, and, indeed, of all serous or fibro-serous membranes; and by its recurrence to reanimate the local action; so that a person may be blooded to that state which has been described as the extreme result of large loss of blood, (§ 54.) and yet, trusting to this practice alone, the local disease has either not yielded, or has passed into one or other of the unfavourable terminations it is liable to assume, particularly dropsical effusion. In the course of practice I have frequently seen persons who had experienced attacks either of pleuritis, pneumonia, peritonitis, enteritis, or of some other inflammation, and who had recovered with great difficulty, and after a long convalescence. Upon enquiry, I found that they had always been blooded largely, and to syncope, — some of them four, five, or even six times, but scarcely ever less frequently than thrice; and yet, upon a subsequent attack of inflammation in its most acute form, in the same or some other organ, a single depletion, practised as I have recommended above, and followed by the means most likely to prevent the return of reaction afterwards, to subdue the local action, to solicit the flow of blood to other parts, and to equalise its distribution over the body, has been sufficient; or, at most, a single repetition of the venæsection has been all that has been required.

67. *c.* When the chest is dull on percussion, the heart congested, the liver large, and the veins distended; or when the circulation is full and strong, the capillaries injected, the lips and mucous surface red, the muscles firm and large, or the respiration oppressed, blood-letting is generally required, and is well borne. It is also necessary even when the pulse is languid, the external venous circulation difficult, and the surfaces pale, if these symptoms be conjoined with those indicating internal congestion. (See Congestion.) On the other hand, persons with an open, soft, full pulse, florid countenance, lax muscles, &c., although they may bear moderate loss of blood, yet suffer more from large depletions than those of a pale, dry, thin, but muscular and rigid habit of body.

68. Under no circumstances ought a patient to

be blooded whilst his head is nearly on the same level with the trunk; and the utmost care should be taken in having recourse to venæsection in cases of dilatation of the cavities of the heart, particularly those of a passive nature. It is seldom necessary in such cases: and if circumstances should arise to require it, the blood should be taken, in the manner I have inculcated (§ 64.), from a small orifice and to a small extent. In the majority of cases, the state of the venous circulation, if duly examined, furnishes some information as to the quantity of blood in the system, and therefore sometimes becomes a valuable guide to blood-letting in some doubtful cases.

69. When the superficial veins are distended, of a deep or dark colour, and the blood flows quickly, and the veins fill rapidly on applying friction and pressure — indicating that their usual state of fulness does not depend upon interrupted circulation about the right side of the heart, or in any part of their course — we may infer that the system is sufficiently supplied with blood. But if the veins are small or pale, the body not being fat; if they swell slowly upon a ligature being applied above them; or are readily emptied by friction, and very slowly refilled; we must infer the existence of a feeble state of the circulation, and a deficient as well as poor state of the blood: and the inference will be further verified if we find this state associated with a pale sickly appearance of the countenance and integuments; a small, feeble, and quick pulse; and paleness of the lips, conjunctiva, tongue, and gums. (See § 43.)

70. C. *Of loss of blood in relation to diseases of depressed vital power, &c.*—There is a numerous class, or rather classes, of diseases, in which blood-letting, either in small quantity, or carried too far, is especially injurious. All those in which the circulating fluid is poorer and thinner, or less pure, than in health, particularly chronic and malignant diseases presenting more or less of the symptoms of anæmia, and disorders occurring in ill-fed and emaciated subjects; those in which the vital endowment of the blood-vessels, or their tonic contractibility, is partly lost, or manifestly reduced, as various forms of fever, puerperal and other diseases in which hurtful matters are apt to pass or to be absorbed into, or not to be eliminated from, the blood; all those in which the vital cohesion of the soft solids is diminished, and the fibrine of the blood is incapable of cohering in the manner necessary to form a tolerably firm coagulum, are injured by large bleedings, or even by depletion to any extent. In the first of these, it is obvious that blood cannot be spared: in the second, although its loss might not be felt in other respects, the vessels cannot accommodate themselves to the state of their contents when any considerable quantity is abstracted: and in the last, as well as in them all, the vital manifestations of the circulating system, and of the solids generally, of which cohesion is one, is so far injured, that the primary morbid condition from which they all proceed is increased by the operation; and, moreover, a greater disposition to the absorption of morbid matters is imparted to the absorbing function, when such matters are within the sphere of its operation, by the vascular depletion.

71. I may, in conclusion, remark, that all diseases essentially spasmodic, and consisting of irregular action of muscular parts, or of altered sensibility of nerves, or of morbid exaltation of their peculiar sensibilities, even when affecting internal organs, or the heart itself, and when no conclusive evidence of inflammation exists, will either be aggravated by loss of blood — in some cases even to a moderate extent — or be readily followed by the effects which have been described as consequent upon an excessive evacuation of this fluid. But I may further add, that, in many cases, where the above reasons for abstaining from large or repeated depletions, or from venæsection, strictly apply, local depletions, under due restrictions, may be resorted to with advantage.

72. iii. Treatment of the Effects of large Loss of Blood. — This will necessarily vary with the particular effect produced, and the state of the patient and of the disease in which excessive loss of blood occurred. The more immediate effects of the loss are the *first* to claim attention; the other morbid conditions, which result from it more remotely, will be considered in succession.

73. *A. Treatment of the primary effects of loss blood.*—The more immediate effects (§ 53.) generally require the recumbent posture, free ventilation, and airy apartments; in the extreme cases, stimulants, sprinkling the face with volatile and fragrant fluids, and even the transfusion of blood. In the worst cases, and particularly when the loss of blood has occurred from the rectum or vagina, the head and shoulders should be placed lower than the pelvis; and care should be taken to ascertain whether or no internal hæmorrhage is going on, as far as this may be accomplished (see *Uterine Hæmorrhage*). In all cases of hæmorrhage, the involuntary discharge of urine and evacuation of the bowels ought to be considered most dangerous symptoms — even more so than the occurrence of convulsions — and the most decided measures should be instantly adopted. Where we have reason to suppose that transfusion will be required, it should not be delayed too long, as the risk from delay is infinitely greater than that from the operation performed by an expert surgeon, and with a proper apparatus. In cases where convulsions or delirium occur, or when these pass into coma or lethargy, it will be necessary to exhibit, internally, stimuli, as æther, spirits of ammonia, and camphor, with a little tincture of hyoscyamus; to sprinkle æther, or lavender water, or eau de Cologne, over the face and head; to apply a blister to the nape of the neck, or on the epigastrium; to support the animal heat in the trunk of the body and extremities; and to administer the lightest and blandest nourishment. Recovery from large loss of blood is usually quick, when the functions of digestion and assimilation have not been greatly injured by it; but when they remain imperfect, or remarkably disordered for some time afterwards, we may dread the formation of visceral disease, and should direct change of air, voyaging, and travelling, with the use of tonic and deobstruent mineral waters, and appropriate internal medicines.

74. *B. Treatment of reaction after large loss of blood.* — Careful reference ought to be had by the inexperienced practitioner to the symptoms indicating this state (§ 58.), so as to distinguish between them and the general excitement consequent upon internal inflammation. This state will require means modified according to the fea-

tures it assumes. But generally the morbid reaction existing in the head, and rendering all the senses remarkably acute, and the system susceptible of impressions, as well as the distressing palpitations of the heart, require the utmost quiet, and small doses of hyoscyamus, or extract of hops, with the preparations of ammonia, and mild nourishment. Where the throbbings or pains in the head are urgent, the surface of the head warm, or delirium exists, cold spirituous lotions, applied over the head, and full doses of hyoscyamus with ammonia, or moderate doses of the acetate or the muriate of morphia, with weak brandy and water, and warmth applied to the lower extremities, will be required.

75. *C. Treatment of consecutive exhaustion, or sinking.* — Here stimulants are required in larger doses; and should be administered by the mouth, in the form of enema, and externally. It is possible that transfusion would also be of service in this state of the system. If coma be present in this stage, large doses of camphor, æther, and ammonia are required, with the tepid effusion on the head; blisters, or mustard cataplasms to the nape of the neck, or epigastrium, or to the feet. In more chronic cases of exhaustion or sinking, gentle nourishment, in small quantities and often; warm tonics, combined with gentle aperients, in order to remove morbid secretions, and relieve flatulence; nutritious enemata, or injections of gruel or mutton broth; and small quantities of weak brandy and water; are the best means that can be adopted.

76. *D. Treatment of certain effects of depletion in relation to disease.* — *a*. Large loss of blood during diseases of excitement (§ 63.) requires a treatment but little modified from that already recommended. When it has occurred during inflammations, a certain degree of irritative action may still continue, notwithstanding the excessive loss of blood, occasioning dropsical effusion into shut cavities; and, when the disease is seated in the lungs, effusions in the bronchi or air-cells, which the powers of life are insufficient to throw off, or to expel. In such cases external derivatives, and a combination of gentle stimuli, with diuretics, anodynes, and diaphoretics, in order to equalise the circulation, and to lower the irritative action in the part affected, often prove of service. When the primary disease is seated in the head, the tepid or cold affusion, cold lotions to the head; external revulsants applied to the nape of the neck, or to the lower extremities; anodynes, camphor, with hyoscyamus, or with acetate of morphine; and the promotion of the alvine and cutaneous secretions and excretions; constitute the principal measures, together with those already enumerated (§74, 75.).

77. *b*. Loss of blood occurring during diseases of vital depression (§ 70.) requires the most energetic means. The objects very generally are to restore, as far as may be, the vital endowment — the tonic contractility, of the vascular system, and to enable it to act with sufficient energy on the fluid circulating through it; to increase the vital cohesion of the soft solids; and to excite the secreting organs to remove the hurtful ingredients that may have passed into, or accumulated in, the remaining fluid, and which tend to vitiate the whole of the structures, and to sink still lower the already depressed powers of life. These ends can be attained only by exhibiting, in frequent doses, the various tonics and stimuli; particularly those which tend to arrest or to counteract the morbid changes going on in the frame, and to rally the powers of life. Of this kind are the preparations of bark, or quinine, combined with camphor, the æthers, particularly muriatic æther, the preparations of serpentaria, spirits of turpentine, wine, opium, and various remedies of the same description, combined according to circumstances, and generally exhibited in small or moderate doses frequently repeated. External stimuli, rubefacient cataplasms and liniments, stimulating and tonic enemata, injections of mulled port wine, with opium and camphor, are often of great benefit. When the secretions require to be carried off, rhubarb and other tonic aperients may be employed. When the disease is attended with *coma*, blisters or sinapisms to the nape of the neck, epigastrium, or the feet, may be employed; and either of the following formula, in the *Appendix*, exhibited (see F. 423. 496. 845. 906.). If low muttering *delirium* be present, the same treatment as is recommended for this state in typhoid fevers is required.

Bibliog. and Refer. — *Montrin*, Des Effets des Differentes Espèces d'Evacuations Sanguines, &c. Lyons, 1810. — *Seeds*, in Lond. Medical Gazette, vol. v. p. 433. — *M. Hall*, On the Effects of Loss of Blood, in Trans. of Med. and Chirurg. Society, vol. xiii. p. 121.; and Researches relative to the Morbid and Curative Effects of Loss of Blood. 8vo. Lond. 1830. — *The Author*, in London Medical Repository, vol. xx. p. 15. — *Piorry*, Mémoires sur la Circulation, &c. Paris, 1831.

VI. Alterations of the Blood in Disease.

78. It will be necessary to the accurate estimation of the causes and results of the various changes of the blood in disease, briefly to consider the relation in which the different functions of the body stand to the blood. These functions are of the following kinds: viz. of *sanguifaction, nutrition, depuration*, and *secretion*; one organ performing, or contributing to two, or even three, of these offices. We know that digestion, absorption, arterial circulation, and respiration, are necessary to the formation of the blood, and to the nourishment of the tissues: we also know that absorption, nutrition, secretion, and venous circulation, are concerned in rendering the blood impure, by conveying hurtful ingredients into it, or allowing others to accumulate in it, or by destroying the relative proportion of its constituents; and that various organs, particularly those of secretion and respiration, are actively concerned in eliminating such matters as become injurious by excess, or pass into the circulation from the various sources of impurity which surround it. Hence it must be evident, that changes in the solids, and particularly in those viscera which are concerned in the supply and waste of the blood, as well as in its depuration, must be followed by changes in the state of this fluid; unless when one or two organs merely have their functions interrupted, and others performing analogous actions to these disorders assume a vicarious office. It must be evident, therefore, from this, that the doctrines of solidism and humorism are, to a certain extent, both correct; that, although disorder may originate in either, it cannot be long limited to one or the other, but must extend more or less to both, according to the nature of the causes, and the organs or parts where their impression is made. We observe in the course of practice, that certain morbid or poisonous ingesta make but little im-

pression on the system, until it is absorbed into the circulation, and by its presence there disorders various organs or parts; whilst other substances make an immediate impression on the nervous system, and, through its medium, impedes the functions of secretion and depuration, and thus the blood itself is rendered impure, and the source whence all the frame is more or less vitiated. Various FEVERS furnish most satisfactory illustrations of this position.

79. Having already considered changes in the quantity of the blood, alterations in its qualities are next to be viewed. The facts which have been observed, connected with this subject, are few and deficient in precision; and the majority of those who have directed their attention to it, have merely described chemical conditions and combinations presented by this fluid after it had been for some time removed from the body, and had lost whatever vital endowment it may have received from the vessels and tissues in which it circulated, or had undergone important changes incidental to this state; instead of describing at the same time such vital manifestations as it may have presented upon its removal, and the relation of its chemical states to the pathological conditions of the body.

80. As we have seen that organisation commences in the chyle, and that this fluid is the chief source whence the blood itself is formed, the importance of studying the alterations of the blood, in connection with the state of this fluid, is evident; but the difficulty of the investigation generally precludes many from engaging in it. At the same time it must be admitted, that very important changes may take place, not only in the blood, but also in the fluids which supply it, and are secreted from it, without being made manifest to our senses upon the most careful examination. I shall now, *first*, furnish proofs of important changes in the constituents and state of the blood in various diseases; and next consider the causes of such changes, and the results to which they usually lead.

81. i. PROOFS OF CHANGE. — *A. In the proportion of the chief constituents of the blood. a.* The quantity of *albumen* varies considerably in disease. It is not sensibly diminished by large or repeated blood-letting, unless the quantity of blood, in relation to the bulk of the body, be much diminished. In many inflammatory diseases, and in a large proportion of cases of active dropsy, the relative proportion of albumen is often very much increased. This has been shown by BLACKALL, TRAIL, GENDRIN, BRIGHT, and several authors. I have always found it remarkably increased in most of the exanthemata, particularly before the eruption has come out. GENDRIN shows that, in inflammatory diseases, the serum of the blood often contains twice as much albumen as in the healthy state. When this is the case, the blood feels remarkably viscid to the touch. In diseases of debility, and when the blood is apparently deficient in quantity, and poor in quality, the albumen is generally very much diminished, being sometimes less than half its usual proportion. M. GENDRIN and M. ANDRAL think that it may also be altered in its nature as well as quantity; and I believe, from appearances which I have observed in the advanced stages of several diseases, that their opinion is correct. In these cases, the albumen seems either precipitated to the bottom of the serum, or suspended in it like a cloud, giving it a turbid opacity.

82. *b.* The proportion of the *watery part* of the blood has been shown to vary in health; but it varies still more in disease, and even in different stages of the same malady. This change is not, however, limited to one, or even a few, of the constituents of this fluid; but sometimes is extended to the most of them. Blood-letting, in acute diseases, diminishes the proportion of coagulum; and, if diluents be supplied, increases greatly the proportion of serum, without lessening the quantity of albumen, unless the depletion be carried very far. In several chronic diseases of debility, in the stages of excitement and exhaustion in fevers, and in the last period or decline of the acute exanthemata, the proportion of serum is very considerable, owing to the interruption of the secreting functions; but in acute inflammations, and the early stages of some of the exanthemata, the blood is of a deep colour, and rich in cruor, with an increased proportion of albumen and of fibrine. In the advanced stages of disease, attended with fluid evacuations, the watery part of the blood is diminished. This is remarkably the case in the pestilential cholera, dysentery, and in some forms of dropsy.

83. *c.* The *colouring matter* of the blood evidently undergoes some alteration during febrile and malignant diseases. It has recently been supposed that such change has an intimate connection with the proportion of the saline constituents of this fluid, — a diminution of these rendering the colouring matter dark coloured, whilst an increase of them has an opposite effect; and certainly various facts seem to confirm the opinion. But this alteration is one merely in relation to colour, which is unquestionably rendered much more deep or black in the last stages of the diseases now alluded to. But besides alteration of colour, there are others which may be termed *dynamic*, inasmuch as they relate to the vital endowment of the globules, or, if not of the globules, of the fluid generally. In the diseases referred to, and after the operation of virulent poisons, the condition of the colouring matter is remarkably changed: it separates readily, and almost before dissolution, from the central corpuscles which it surrounds; and, passing through the exhalent vessels of mucous surfaces, with the serous or watery part of the blood, gives rise to the sanious cruor, and the dissolved blood, which we sometimes observe issuing from these parts shortly before or after death; and probably to the black vomit in yellow fever. In cases of infection by animal poisons or morbid secretions, this separation of the colouring matter, and solution in the serum, take place very early, indeed almost immediately after death; and it is evidently owing to this change in the blood, that the interior surface of the blood-vessels becomes so deeply coloured, without any other appearance of inflammation. Indeed, the evidence adduced by M. TROUSSEAU fully proves this to be the case. (*Archives Gén. de Méd.* t. xiv. p. 321.) This further accounts for the coloration of the interior of arteries in fatal cases of adynamic or malignant fevers, — an appearance first particularly noticed by J. P. FRANK, and subsequently by many others, and by some incorrectly ascribed to inflammation.

84. *d.* The *fibrine* varies greatly in its quantity, and as to the states in which it presents itself in the blood removed from the body. Its condition will be somewhat modified by the manner in which blood-letting is performed; but generally it soon separates from the serum, and, with the red particles, forms the crassamentum or clot, which will vary in its appearances with the degree of nervous energy exerted by the organic nerves on the vascular system, and the quantity of fibrine. *a. First,* the fibrine and red globules may be in much greater proportion relatively to the water and albumen, and still the crassamentum formed therefrom will be very different, according to the state of vascular action and nervous energy at the time when the blood was abstracted. If the vascular action be increased, or in a healthy state, and the vital energy unexhausted, the fibrine will contract into a firm and large coagulum. If the fibrine retain its relatively large proportion, and vascular action be exhausted, it will contract so imperfectly or loosely, as to enclose a large portion of the serum, and to leave but little of this fluid surrounding it. In the former case the coagulum possesses much density: in the latter, extremely little; indeed, sometimes not sufficient to separate it sensibly from the serum. In such cases the blood is *rich,* although otherwise very different in appearance, owing to the state of action and vital power.

85. *β.* In the *second* place, the fibrine may be in small quantity, and yet present a state of firm attraction, forming a small coagulum in the midst of a larger proportion of serum than is usual in health. Or the proportion being still small, the cohesion of the fibrine may be so weak as to form a tolerably large coagulum; whilst, in other cases, it will scarcely separate from the serum, owing either to its diminution, or the weak attraction of its corpuscles. I have met with it in several cases so nearly wanting, and so deficient in attraction in other instances, as not to form any coagulum; the red particles having been, as it were, precipitated to the bottom of the vessel in a dark or blackish sediment, without any cohesion in the form of clot. From this it will be inferred, that the quantity of fibrine cannot be reckoned from the apparent size of the coagulum merely, but from the size in connection with density or degree of cohesion. When the blood is deficient in red globules, and fibrine, it has usually received the appellation of *poor* blood; the degree of cohesion existing between the particles of fibrine in it, as well as in rich blood, being the general index of the degree of nervous power. But there are apparent exceptions to the indications it presents. Thus, in acute rheumatism, after repeated depletions, injudiciously resorted to, —injudiciously, because a frequently injurious, and seldom a beneficial practice—and during the reaction consequent upon repeated blood-letting, the fibrine, although much reduced in quantity, will often still continue to adhere firmly, or even to form, in some cases, a buffy coat, and yet the powers of life are reduced very far beyond what the state of the fibrine would seem to indicate. In these cases, the cohesion of the coagulum, and the formation of the buff, are, as well as in many other circumstances of disease, principally the result of vascular reaction, occasioned by morbid excitement of the nervous influence; and as long as these states exist, this condition of the coagulum will occur, although depletion be carried to the utmost extent.

86. *γ.* Whilst the blood is still circulating in the body, particularly in the last stages of various chronic diseases, the repulsion existing between its existing globules may be so far destroyed as to admit of the fibrinous corpuscles adhering to each other, in some part of the vascular system, or even in one of the cavities of the heart. The fibrinous concretions thus formed are attributable, 1st, To retarded or obstructed circulation of the blood in the part. Van Swieten and Haller state that flocculent and fibrinous coagula have formed in the blood of the pulmonary artery during syncope and the cold stage of agues; and they, as well as numerous later observers, have found these productions after exposure to extreme cold, and when death has been preceded by a very languid, obstructed, and irregular state of the circulation. 2d, To effusions of a small portion of coagulable lymph from the inside of a part of the vascular lining, during a state of inflammatory irritation; which lymph may have become the nucleus around which the fibrinous particles may have collected, or the bond of cohesion between them in the first instance: and, 3d, Particularly as respects those fibrinous concretions, in the centres of which purulent or tubercular matter has been found, as in the instances adduced by MM. Legroux, Maréchal, and subsequently by others, to the absorption of these matters, or to their passage into the blood from the internal coats of the vessels on which they may have been formed; and from becoming nuclei around which the fibrine has concreted. In some instances, in which these fibrinous masses have been found, little or no connection with the surrounding vessels can be traced. M. Andral supposes that these concretions are possessed of a separate vitality, and that the matter detected in their centres is a product of vessels previously formed in them. This opinion, however, cannot be supported, inasmuch as the matters formed in their centres have no relation to, nor have they been found often surrounded by, blood-vessels; and, when vessels have been detected, the firm attachment of the concretions to the inner surface of the vessels attests the manner of their formation to be identical with that of other productions of a similar kind.

87. *δ.* But the attraction between the particles of fibrine, which is usually observed when the blood is removed from the sphere of vital endowment, in which it participates, instead of being exerted, as now stated, within some part of the vascular system, may be entirely lost, or be very irregular or imperfect. In such cases, the blood either remains altogether fluid; or its fibrine, and some part of its albumen, form grumous particles, or minute fragments, which are either suspended in the serum or mechanically mixed with it, forming a sanious cruor in the vessels. This latter state is observed sometimes locally, and often generally, immediately after death; as in the veins of the spleen, liver, of the extremities, &c. A thick, dark, and treacle-like state of the venous blood, and a venous appearance of the arterial blood, are not infrequent during life; particularly in pestilential cholera, in asphyxia, hydrophobia, &c.

88. *ε.* The *buffy coat* observed to form the upper part and surface of the coagulum, most frequently, in cases of inflammation, consists of fibrine,

according to **Deyeux** and **Parmentier**; of fibrine, and especially concrete albumen, in the opinion of **Fourcroy**, **Vauquelin**, and **Thenard**; of fibrine and gelatin, according to **Orfila**; of fibrine, containing serum between its fibres, and albumen, or very albuminous serum, according to **Dowler** and **Gendrin**. **Berzelius** considers that it may contain all the elements of the coagulum. It manifestly is produced by the concretion of the fibrine, which, parting from the colouring matter, forms a whitish yellow, or slightly greenish layer, varying in thickness from a line to one or two inches; and giving rise to the *cupped* appearance of the clot, by the firmness of attraction between its particles. The formation of the buff may be somewhat favoured by the size of the orifice from which the blood has been drawn, the rapidity with which it has flowed, and the form of the vessel in which it has been received; but the buff itself entirely depends upon the state of the fibrine, which, in conjunction with a portion of serum and much albumen, not only chiefly constitutes it, but modifies it in the manner already noticed, according to the state of vital influence and vascular action. (See § 84. and art. **Inflammation**.)

89. *e.* Respecting changes in the *saline constituents* of the blood, we are provided with but little information, and that by no means of a precise character. So much difference has existed amongst chemists respecting the actual saline ingredients of healthy blood, and their state of combination in this fluid, that a standard has not been furnished for comparative observation. According to Dr. **Stevens**, they are very sensibly diminished in the blood of patients affected by the fevers of warm climates; and Dr. **O'Shaughnessy** has shown that the blood of those suffering from pestilential cholera contains much less saline constituents than in health.

90. *f.* The *electrical condition* of the blood may also be changed by disease. **Bellingeri** states the electricity of venous blood to be equivalent to that of antimony; that it is an imperfect conductor of this agent; and that its electricity is diminished in inflammatory diseases. According to **Rossi**, the blood presents, in severe fevers, modifications of its electrical states. That electricity, when acting energetically on the frame, affects the blood (probably through the medium of the nerves supplying its vessels) in a most intense manner, is shown by the dissolution and decomposition of this fluid after death from this agent. The evident effect of light upon the blood, in rendering it both more abundant and rich, may be attributed to the electrical states of the solar rays.

91. *g.* The *temperature* of the blood has been observed to vary, during the course of disease, from 86° to 104°. It has been observed as low as the former grade in pestilential cholera, and the cold stage of ague; and as high as the latter in the stage of excitement in fevers, and visceral inflammations. Its temperature is evidently owing to the degree of nervous power in connection with vascular action.

92. *B. Changes in the intimate nature of the blood, for which mere difference in the proportion of its constituents cannot account; and which are referrible to the state of vital power.* — Important changes of the blood, which are evidently not referrible merely to alteration of the healthy proportion of its constituents, although such alteration may be considered as often co-existing with those other inappreciable modifications upon which its morbid effects chiefly depend, occur in the course of various diseases; and, when once induced, occasion not only violent or fatal effects as respects the individual subject of them, but also similar changes in healthy persons inoculated with this diseased blood. Dr. **Home** communicated measles by means of blood taken from persons affected by them. **Duhamel** records a case of a butcher, who, having put in his mouth the knife with which an over-driven ox had been slaughtered, had his tongue and throat swollen a few hours afterwards, and an eruption of blackish pustules over his body. He died in four days. Another person, having wounded himself in the hand with a bone of the same ox, was seized with inflammation of the arm, followed by mortification and death. Two females experienced also gangrenous inflammation from a few drops of the blood of the same animal having fallen upon the hand of one, and on the cheek of the other. Inoculation with, or even the simple contact of, the blood of diseased animals, may produce in men the malignant pustule. Of this numerous proofs have been furnished. MM. **Dupuy** and **Leuret** introduced into the cellular tissue and veins of a sound horse, blood taken from a horse affected with malignant carbuncle (pustule maligne), and thus produced the disease. The serious effects also observed to follow wounds in dissection, either of recently dead bodies, or of those in which decomposition has commenced; the changes which take place in the blood, either primarily or secondarily, in various maladies; the septic influence of certain animal secretions and poisons on the tissues to which they are applied, on the blood, and on the frame generally; are among the most important phenomena of disease. I shall, therefore, proceed to a more minute examination of this department of pathology than it has recently received. That these changes are of a most important nature; that they may arise from various causes, or from spontaneous alterations taking place in the blood while circulating in the vessels of the animal, even whilst those changes are so slight as to escape detection by our senses; and that the blood, when thus changed, will be the cause of disease presenting a malignant character, when applied to or inserted into the tissues of healthy animals, are facts which the preceding, as well as other evidence about to be adduced, fully demonstrate. The chief of these changes, to which I attach the utmost importance, having observed them to exist more or less in a large proportion of cases where blood has been removed, or escaped from a vessel, in malignant or adynamic diseases, or in the last stages of very acute and dangerous maladies, are the following: —

93. *a.* The blood has generally a somewhat salt *taste* in health, evidently depending chiefly upon the quantity of muriate of soda contained in it. In various maladies, particularly those which are malignant, and in the advanced stages of fevers, this taste is not so remarkable, particularly when the blood assumes a darker hue than natural. *b.* The peculiar *odour* of this fluid upon emission from a vein is also very remarkably changed in these maladies. **Haller** has adduced numerous instances of this in his great

work; and various authors — and amongst these, VAN SWIETEN, HOFFMANN, SCHWENCKE, HUXHAM, LININGS, &c.—have noticed a remarkable fœtor of the blood in adynamic fevers and pestilential maladies. I have observed a peculiar odour of the blood in cases of malignant puerperal fever. We are informed by LOUIS DE CASTRO, that the blood of two plague patients infected the air of their apartment with a fœtid odour; and ZACUTUS mentions, that three persons were struck dead by the odour exhaled from the blood drawn from the vein of a person infected with plague. MURALT also states that a cadaverous fœtor emanates from the blood of persons affected with this malady; and BAGLIVI mentions that a nearly similar phenomenon was observed in the blood of patients in the advanced stages of a very fatal epidemic fever. HALLER prognosticated a fatal issue, chiefly from this symptom, in a case to which he refers. ZURINUS, ALPRUNNER, and VATER, allude to cases where physicians were dangerously infected by the fœtor of the blood, upon its abstraction from the veins of persons in malignant and contagious diseases. BOISSEAU states, that he has been very disagreeably affected by the odour of the blood just abstracted from the veins of persons attacked by severe disease of the chest or abdomen. PRINGLE relates, that an individual was seized with dysentery, after inhaling the odour from the blood of a dysenteric patient, kept for a long time. The blood taken from a vein in the arm of a woman in a malignant fever, was, according to MORTON, so offensive, that the surgeon and assistants fainted in consequence. It may be therefore inferred that both the odour and the taste of the human blood may be very sensibly changed in the advanced progress of various adynamic, infectious, and malignant maladies.

94. *c.* Softness or firmness of the *coagulum* has been already noticed, in connection with the condition of the fibrine; and stated to be often independent of the quantity of this constituent, and to be chiefly owing to the degree of nervous influence and vascular action. In the class of diseases now alluded to, the coagulum is not only remarkably soft, but, from the want of adhesion, and from the solubility of the colouring matter in the serum, is sometimes readily converted into a reddish fluid by slight agitation with it. In other cases no coagulum forms, the fibrine being suspended in small albuminous-like fragments in the serum, and the colouring matter precipitated to the bottom of the vessel. In several instances, these constituents are not separated from the serum, but seem combined with it; the whole mass remaining more or less fluid, and presenting a reddish, reddish black, or blackish colour, from the time of its emission till it furnishes evidence of decomposition. I have met, in other cases, with the blood changed into two parts: the upper and serous part consisting of a remarkably soft gelatinous mass, sometimes almost fluid, resembling very weak or uncoagulated calves-foot jelly, and forming from two thirds to four fifths of the whole; the colouring matter being spread over the bottom of the vessel, and presenting a dirty, black, and muddy appearance. I have also observed, and very lately, in two cases to which I had been called by neighbouring practitioners, the colouring part of the blood, with a portion of the fibrine and albumen, deposited on the bottom of the vessel, of a colour between a deep brown and dirty dark grey, the serum being very abundant and turbid.

95. *d.* Appearances analogous to the above are also observed whilst the blood is in the veins of the dead body. In many cases, it is either fluid or semifluid, treacly, and of a dark colour. In others it is apparently decomposed and grumous; and in some, either consisting of perfectly fluid blood, or resembling water coloured with a reddish brown matter. In some cases, where the blood has been partially coagulated or separated into a grumous state, the more fluid parts, generally in the form of a bloody or sanious serum, have percolated the tissues, and escaped through the relaxed exhaling pores and extremities, and passed into the shut cavities; but more frequently flowed out on the mucous surfaces, leaving the more consistent parts of the blood in the vessels in larger proportion than in health. In all these cases, the blood, whether that drawn from the veins, or found in them after death, seems not so deficient of fibrine, as that its state is changed owing to exhaustion or annihilation of vitality, by virtue of the possession of which (derived from the influence of the organic nerves on the blood-vessels and internal viscera) its fibrinous corpuscles are aggregated into a coagulum when removed from the veins.

96. ii. FURTHER PROOFS OF CHANGE IN THE BLOOD, AND ITS RELATION TO PARTICULAR KINDS OF DISEASE. — *A. The existence of a buff on blood* drawn from a vein has always been regarded by practitioners, as a sign, not only of disease, but also of inflammation. GENDRIN (following the path of his predecessors) asserts, that the blood is in a *very inflammatory* state, when it coagulates quickly; is covered by a thick, concave, dense, elastic, buff, of a yellowish white; and separates into a truncated, ovoid, dense, elastic clot, floating in a serum, which bears a proportion to it of one and a half or two to one; is slimy, colourless, slightly turbid at the bottom of the vessel, and without any trace of colouring matter. The clot more rarely is of the shape of a truncated cone; is very dense at its surface, pretty soft at its base; does not float; and is more voluminous than the serum, which is of a pale yellow: in this case the blood is *more than very inflammatory*.

97. He observes that the blood is *inflammatory*, when the buff is thick, diaphanous, of a dull white, and covers a rather dense cylindrical clot, beneath which is the serum, yellowish, and equal at most to twice the volume of the clot, a slight colouring deposit being found at the bottom of the vessel. If there be any buff when the blood is *sub-inflammatory*, the clot does not float, but is suspended in the middle of the liquid, or is precipitated, and is less dense than in inflammatory blood; the serum is slightly tinted with red at the bottom of the vessel, where a layer of colouring matter may be seen. But usually there is no buff; the clot is dense, ovoid, floating, and presenting a red stratum on its surface; the serum is viscous, limpid, somewhat turbid at the bottom of the vessel, where no colouring matter can be observed. The blood in this state coagulates quickly, and yields serum of at least twice the volume of the clot. When the proportion of serum is less than twice that of the clot, and the latter is soft, cylindrical, voluminous, although

floating, the blood is *scarcely sub-inflammatory*; it is so in a slight degree, when the clot is dense, ovoid, and pendent in the middle of the vessel; when, of those two last mentioned coagula, the first occupies the middle, and the second the bottom of the vessel, the blood is *more inflammatory*.

98. This description is tolerably accurate, particularly as respects *inflammations of serous membranes, pneumonia,* and other *visceral inflammations,* when the circulation is free and the pulse not oppressed. But every one must have observed, that there may be very acute inflammation, and yet the blood is not buffed, particularly in children; and, on the other hand, that this appearance often exists to a greater or less extent in *plethoric persons,* in pregnant and *puerperal females,* in those who resort frequently to blood-letting, and *in rheumatism,* even in its least inflammatory forms. M. GENDRIN also errs as respects the rapidity with which inflamed blood coagulates. When the powers of life are unimpaired, and the circulation quick, and particularly during acute and general vascular reaction and vital or nervous excitement, coagulation is either longer in taking place, or, if it commences soon, it is much later in being completed than in other cases; but much will depend upon the stream of blood. If this be full, quick, and large, and the temperature of the apartment high, coagulation is delayed, and the buff more readily appears. If the stream be small, slow, and the temperature low, coagulation is rapid, and no buff is formed.

99. In some cases of *intense inflammation,* no buff appears, the blood coagulates slowly, the clot is less dense, and less serum is formed than in health; but the coagulum is very distinct from the serum, into which it does not at all dissolve. This, although another condition of the blood in a state of inflammation, is observed also in cases where the inflammation is not excessive, as every practitioner must have had numerous opportunities of ascertaining. Two superimposed layers of buff are sometimes seen — the one soft or friable, the inferior more dense, more compact, — but not (as is asserted) only when suppuration has taken place in an inflamed organ; still less must we receive as a sign of suppuration the dusky white or opacity of this buff, and the presence of a mucous stratum at the bottom of the serum. In short, it does not always happen that the buff shows itself on the blood in chronic phlegmasia, until the subject has become enfeebled, and the nutrition deteriorated. A repetition of bleeding, and a tendency to syncope, causes either a diminution, or the entire disappearance, of the buff. According to PLENCIZ, when the blood is not buffed in inflammations, the coagulum is always more firm than natural, — an observation which is tolerably correct in respect of the state of vital power, but not as regards the presence of inflammation. It should not be overlooked, that in many cases of very acute inflammation, particularly in its early stage, the nervous power may be so oppressed, and general vascular action consequently so imperfectly developed, that the coagulum will neither be firm nor exhibit any buff on the first and second blood-lettings; and yet, when this oppression has been removed, a firm and sizy coagulum will be formed by the blood subsequently drawn. This is particularly the case when the respiratory function has been oppressed at the commencement of the attack.

100. Out of four and twenty cases of *peripneumonia* terminating fatally, LOUIS found the blood of nineteen of these patients covered by a buff, which was firm and thick at each bleeding in fourteen cases; soft, and sometimes infiltrated, in the others. It was cupped only in two fifths of the whole number of patients. The buff was absent in only six cases out of fifty-seven, which recovered. It was very thick, and cupped, in twenty-three of them. The blood was covered by only a slight buff in three cases out of five of *hydrocephalus,* softening of the brain, or *apoplexy;* and in another instance of softening of the brain, the blood remained semi-liquid, without clot or buff.

101. In four cases of *scarlatina, small pox,* and *measles,* which terminated favourably, the blood was covered by a thin and not very consistent buff; in one case of scarlatina it was firm and thick: of the same character in five cases out of seven of *erysipelas* of the face, and in four cases of *angina,* while in a fifth it was soft; in nine tenths of rheumatic patients it was equally firm and thick; in two subjects affected by *zona* it was not present. It was somewhat thick in four cases of *erythema,* where the circulation was considerably accelerated; thin, in four out of fifteen cases of *pulmonary catarrh.* According to GENDRIN, the buff never appears on the blood of variolous patients until after the eruptive fever begins; it is more strongly marked when the inflammation is more intense, and lasts even after desiccation has taken place. When buff appears at the very first, BAGLIVI is of opinion that the eruption will be considerable.

102. *B. Other states of the blood in various diseases.* — M. BOISSEAU states, that he has seen the venous blood of a lively red — now and then of a *clear rosy red* — and spouting in a transparent thread, in patients afflicted with inflammation of the lungs, and sometimes in those with inflamed joints. Among those with peripneumonia, but who were otherwise of sound constitution, he has noticed it covered by a *greenish buff;* yet the greater part of these patients recovered after repeated bleedings. In a very fine young girl, who had enjoyed good health, but was attacked by pain in the side in consequence of a chill, the blood was of a *dirty grey,* approaching to violet, and like lees of wine: after this bleeding she suffered no more, although her skin continued yellow for some months. M. BOISSEAU has also seen blood like *turbid wine* in several cases of pulmonary inflammation, which were nevertheless cured, the patient suffering little more in consequence of the unusual appearance in the blood.

103. In fact, the *hæmorrhagic blood,* as also that taken from the veins of subjects attacked by *inflammation,* is not always consistent and buffed; it is sometimes found dissolved, thin, and serous. The latter appearance is, indeed, less common than the former; but sufficiently so to teach us not to attach too much importance to the aspect of the blood in inflammations, and also not to forget that, whatever may be its condition, phlegmasia will develope itself when the causes from which it springs are sufficiently powerful.

104. A *whitish appearance* of the venous blood has been long observed, arising from the presence of white flakes or streaks. This has been ascribed

to various causes; but with greatest truth to the existence in it of a large portion of unassimilated chyle. The separation of the blood into a soft or natural coagulum, and a milky serum, is much more common. This, as well as the foregoing state of the blood, has been imputed to various causes. Emmert considered that it was owing to a substance analogous to buff. Some have ascribed it to milk; others to albumen; a few pathologists view it as owing to a matter analogous to fibrine; and several, as proceeding from the admixture of liquid fat. Haller imputed it to liquid chyle. Of these opinions, the two last are the most accurate. There can be no doubt that both the milkiness of the serum, and the whitish streaks observed in venous blood, are owing in a great measure to unassimilated chyle; and the more accurate researches of modern chemists, particu-Christison, Babington, Le Canu, &c. have detected in this kind of blood an unusual proportion of oily matter. This state of the serum is occasionally met with in various diseases, functional as well as organic; and seems connected with deficient assimilating power. Sydenham states, that he observed the blood drawn from a young convalescent to resemble pus, — an appearance probably owing to the great quantity of chyle carried during convalescence into the blood, which had been poor and defective, and to the circumstance of this fluid not having then experienced the process of sanguifaction. Nicolas and Guendeville have noted, that the blood of *diabetic* patients contains an increase of serum, and very little fibrine: this serum contains, according to Rollo, a saccharine matter; about the thirtieth part of what is found in urine, according to Wollaston.

105. During the prevalence of *scurvy* in Admiral Anson's fleet, the blood taken from the veins, after the eruption had appeared, was marked with dark or with vermilion streaks; on first issuing from the veins it was dissolved and very black, but after standing some time it thickened, and assumed a dark colour; no regular separation of its serum took place, and its surface was greenish in several places. When the disease had arrived at its third stage, the blood was as black as ink; and although it was kept several hours in a vessel, its fibrous part precisely resembled wool or hairs floating in a muddy substance. The blood issuing from the mouth, nose, stomach, intestines, or any other part, in the last stage of this malady, was entirely decomposed, black, or yellowish. It was found after death entirely dissolved in the veins, so that by cutting some branch of a rather large vein, it was possible to empty all the neighbouring branches with which it communicated of the yellowish black fluid they contained. The extravasated blood was of the same nature. In a scorbutic patient, opened by order of Cartier, the cavities of the heart were stated to have been entirely filled with corrupted blood.

106. In four cases of scurvy, Rouppe has found the right cavities of the heart filled with black and coagulated blood; and a greenish yellow polypus-like matter filling the left cavities of this organ, the aorta, and the pulmonary artery and vein. Amongst the scorbutic subjects opened at Paris in 1699, by Poupart, it was found that in those who had died suddenly, the auricles of the heart were dilated by coagulated blood, the muscles loaded with black and corrupt blood, and the cellular sub-cutaneous tissue infiltrated by extravasated, black, coagulated, and congealed blood, in some cases, and by red blood in others.

107. Bichat found in a dead body, instead of venous blood, a greenish sanies, which filled all the divisions of the splenetic vein, the trunk of the vena porta, and all its hepatic branches; so that when cutting the liver, he distinguished by the flowing of this sanies all the branches of the vena porta from those of the hepatic vein, which contained blood in a natural state: this body was remarkable for such an excessive obesity, that Bichat never remembered seeing any thing equal to it. Unfortunately he does not give us the symptoms of the disease of which this person died.

108. According to Coyter, Gendrin, and many others, a black pulverised-like substance deposits itself at the bottom of the vessel containing blood taken from persons affected with *typhoid*, malignant, and gangrenous diseases; the clot being often either completely dissolved, or not formed at all. I have seen these appearances, and various modifications of them alluded to above (§ 94.), not only in these diseases, but also in *hæmatemesis*, *dysentery*, severe infectious *erysipelas*, *phlebitis*, the dangerous forms of *puerperal* diseases, puerperal *mania*, and in *purpura hæmorrhagica*.

109. Remarkable fluidity of the blood is always observed after death from severe blows on the epigastrium, and from lightning. J. Hunter states, that he has also found it fluid after death from a violent fit of passion. Morgagni observed it in a similar state after death from hunger; and M. Audouard relates, that that it was uncommonly fluid in a man who died from *coup de soleil*, voiding blood from the mouth and nostrils. In two cases of *hydrophobia* I found the blood black; so fluid in the heart and veins, that it flowed out abundantly from the vessels of the head and neck, presenting an infinite number of oily points or particles on its surface; and, when removed from the vessel, it did not afterwards coagulate. The same appearances were observed in a large proportion of the numerous cases described by M. Trolliet, and other authors on this disease. M. Trolliet states, that in several of his cases, a considerable quantity of gas escaped from the heart and aorta.

110. iii. The Causes of Changes in the healthy state of the Blood.—The causes which occasion morbid changes in the state of the blood, are either such as are confined in their operations to individuals, or such as influence whole classes, or the community generally. They may thus be sporadic, endemic, or epidemic. In respect to their mode of operation, they may be arranged, 1st, Into such as vitiate the fluids from which the blood is formed; 2d, Into those which impede the functions of secretion and depuration; 3d, Those putrid or septic matters which contaminate the tissues and fluids to which they are applied, and act chiefly by absorption; 4th, Those which act upon the vascular system, either directly or indirectly, through the nerves which supply it; and, 5th, The passage into the blood of morbid matters formed in the same body that is the seat of disease.

111. *A. Of vitiation of the blood by the fluids which form it.* — The fluids which supply the waste of the blood are not infrequently vitiated,

and thereby change the state of the circulating mass. The chief sources of this vitiation are hurtful or unwholesome ingesta. Many articles, even of food, will be hurtful when too long continued. The injurious effects of salt provisions on the blood, when exclusively employed, and particularly if depressing causes cooperate with this diet, are evident, and are fully illustrated in the article on SCURVY. The influence of diseased rye, in first changing the condition of the blood, and inducing a state of chronic arteritis, terminating in gangrene of the extremities, is also well known; and the effects of diseased or putrid flesh upon the system have been often noticed, although not always correctly traced to the quarters where the principal changes are produced. M. BERTIN states that a number of negroes in Guadaloupe, having eaten the flesh of some animals dead of an epizooty, were seized with fever, and violent ileus, of which the greater number died: and numerous cases are on record, where persons shut up in besieged towns, having partaken of putrid animal matter, or of the flesh of animals that have died, have been seized with malignant states of disease; and the blood has been found fluid, dissolved, blackish, grumous, &c. upon examination after death. In these, and numerous similar instances which might be adduced, although the state of the blood has been alluded to in general terms, the information has been deficient in precision, and has been furnished incidentally, the attention of the observer having been directed to other quarters.

112. M. MAGENDIE adduces, in his Journal, the instance of a man, who, after a long use of vegetables in which the oxalates abounded, underwent the operation of lithotomy, and a large oxalate of lime calculus was removed from him. We know that a large proportion of both our mineral and vegetable medicines operate by being absorbed into the circulation (see art. ABSORPTION, &c.); and there is every reason to suppose that various morbid or foreign matters may pass with the chyle into the blood, and modify its condition. The excessive or long continued use of alkalies, or of alkaline salts with excess of base, has the effect of diminishing the cohesion and the viscosity of the blood, and of preventing it from coagulating after it has been removed from the vessels; and while these substances thus, as it were, dissolve, or attenuate this fluid, they also diminish the vital cohesion and tonic contractility of the extreme vessels and of the tissues, and create a disposition to extravasation of blood in the parenchyma of the organs, and to exudation of it from the mucous surfaces. On the other hand, the acids — particularly the mineral acids — turpentine, the superacetate of lead, and all the salts—especially those with excess of acid—have the effect of increasing the healthy crasis of the blood, and of producing an opposite change to that now stated. When used in excess, however, or injected into the veins, they have been conclusively shown to give rise to fibrinous concretions in the vessels, to coagulate the albumen of the blood, to darken its colour, and thus to render it grumous and unfitted for circulation through the minute capillary vessels, particularly those of the lungs. The influence of salted provisions long and exclusively employed, in which the soda is generally in excess, in attenuating the blood, in preventing its coagulation when removed from the vessels, and in relaxing the soft solids; and the effect of acids in removing these morbid states; are well illustrated by the nature, progress, treatment, and prophylaxis of scurvy.

113. That the nature of the food materially affects the state of the blood is further shown by the general character of the diseases most prevalent in various communities, living chiefly on certain kinds of aliment. The inhabitants of several places in the north of Europe, who live principally on *fish*, a large proportion of which is usually kept until it has become remarkably stale, or even ammoniacal, from incipient decomposition, who seldom partake of flesh meat unless in a similar state of change, and who dry or smoke both these kinds of food, instead of salting them, are generally subject to diseases which arise from, or are connected with, an impure state, or weak cohesion, of the circulating fluid. It should not, however, be overlooked, that the more complete changes which respiration effects on the blood in cold climates, and the active exercise of the functions of depuration, under the influence of the vital energies, serve to counteract the morbid alterations which this cause would induce. Yet still the prevalence of disorder in these eliminating organs, particularly the mucous and cutaneous surfaces, which preserve the purity of the blood; and the marked disposition, which all febrile diseases evince, in persons thus circumstanced, towards vitiation of the circulating fluid; and the consequently low or adynamic symptoms which characterise their progress and termination; are sufficient indications of a change in the constitution of this fluid. It is worthy of notice, that communities which live in the manner now alluded to, generally employ remarkably acid beverages, usually consisting of the fermented whey of butter-milk, and a fermented farinaceous infusion. I believe that nothing could be used as common drink better calculated than these to counteract the ill effects of their diet on the blood. Besides the acid existing in these beverages, they also contain much carbonic acid gas, which likewise contributes to their wholesome influence on the blood.

114. The effects of living upon much fresh animal food, in increasing the quantity of fibrine, in rendering the blood rich and abundant, and in disposing to inflammatory diseases, are too well known in all their relations to require illustration. But when we consider the influence of various kinds of aliments in modifying the state of the blood, we ought never to overlook that, as its organisation and vital manifestations commence with the chyle, and depend upon the vital condition of the vessels and tissues, and upon the perfect discharge of all the functions which contribute to its formation and purification, the extent of mischief produced by unwholesome food will be commensurate with the deficiency of vital energy, and the imperfection of the various organic functions. A person of a robust constitution, breathing a pure air, and assisting the eliminating functions by regular exercise, will suffer much less, than the debilitated, the indolent, and those placed in unhealthy localities, from either unwholesome food, or from the accidental ingestion of injurious substances. A person thus circumstanced will also suffer less from the habitual

indulgence in too much animal food; but more commonly such indulgence will give rise to a superabundant secretion of uric acid, and favour gravel. In such persons, also, there is reason to suppose that urea, or uric acid, may exist in the blood, and be deposited from it in various parts of the body, particularly the small joints. The uric acid, which becomes thus abundant, is a highly azotised animal principle, obviously formed from the excessive use of food which abounds in azote; and when its appropriate emunctory, the kidneys, fail of carrying it out of the blood, it is secreted in other parts.

115. *B. Imperfect performance of the functions of depuration, a chief cause of morbid states of the blood.* — The evident influence of this class of causes renders it a matter of surprise that it has been so long overlooked in our estimation of the causation of disease. When the facts which have been brought to light by the successful investigation of the animal functions are duly weighed, and estimated in connection with the sources of impurity to which the circulating fluid is exposed, the importance of assigning a due rank to this kind of morbid agency will become manifest. When we consider the important changes that take place in the lungs — the quantity of carbonaceous fluids constantly discharged through this organ, and of watery vapour loaded with various impurities continually exhaled from its surface, and passing out with the expired air; or the abundant perspiration, sensible as well as insensible, constantly issuing from the cutaneous surface, and holding dissolved in it substances which require to be eliminated from the circulation, owing either to their excess or their foreign and hurtful nature; or the varying state of the urinary secretion, the quantity eliminated, and the changes it manifests from variations of temperature, atmospheric moisture, and especially from the abundance and nature of the ingesta; or the discharges which the female experiences during the greater part of her average duration of life; or the secretions formed by the liver, the internal surface of the bowels, the pancreas, &c. out of elements which, if not combined into these new forms, and destined to ulterior purposes, would become poisonous to the frame, by vitiating the blood; it must be evident that an interruption to any one of these several functions, if not compensated for by the vicarious increase or modification of some others, must be followed by alterations of the quantity, of the quality, of the relative proportion of the constituents, and even of the vitality of this fluid.

116. *a.* Under the due dominance of the vital energy of the system — and particularly of that influence exerted by the organic nerves on the great secreting viscera, and on the whole vascular system—no sooner does any substance, which may have been carried into the circulation, or accumulated in it, become injurious, than it is eliminated by the appropriate action of some organ, which often evinces a kind or degree of disorder, either in its actions, or in the state of its secretions, according to the nature of the substance which affects it. Thus, we perceive various substances and kinds of food, even in health, affect the actions and secretions of the kidneys, of the skin, and of the bowels; certain of their constituents becoming sensible in the halitus of the expired air, in the perspiration, or in the urine, where they could be transported through the channel of the circulation only. The fœtor, &c. of the breath, and of the perspiration, &c. consequent upon interruptions of the abdominal secretions, also indicates that impurities have accumulated in the circulation, and that they are being eliminated by means of the lungs and skin. So long as the vital energy is sufficient for the due performance and harmony of the functions, injurious matters are seldom allowed to accumulate in the blood to the extent of vitiating its constitution, without being discharged from it by means of one or more organs; but as soon as this energy languishes, or is depressed by external agents and influences, and the blood is thereby either imperfectly formed, or insufficiently animalised and depurated, some one of its ultimate elements or proximate constituents becomes excessive, and the chief cause of disorder, which terminates either in the removal of the morbid accumulation, or in a train of morbid actions and organic lesions. These very important pathological facts are so fully proved by the history of the most prevalent and serious diseases, and by their terminations and results, and are so perfectly unopposed by accidental or occasional exceptions, that proofs or illustrations of their value and uniformity are superfluous.

117. Thus it will appear that, although changes in the secretions and in the blood itself are most influential in the production, perpetuation, and aggravation of disease; yet such changes are prevented, controlled, and even in some cases promoted, by the state of the nervous energy and vital actions of the frame; to which influence they are always more or less subject, unless when the causes of the disorder are so intense, in relation to its state, as entirely to annihilate it, as is occasionally remarked in respect of the most pestilential diseases, and of the operation of some virulent poisons. Thus, also, will it appear, not only that hurtful matters carried into the circulation, and ultimate elements or proximate constituents allowed to accumulate in it, owing to the imperfect performance of some eliminating function, will be removed from it, when the vital influence is sufficient for the task; but that both kinds of injurious agents will, according to their natures, become productive of a vitiated state of the blood, of the secretions formed from it, and even of the various tissues themselves, when the state of vital manifestation, particularly as displayed in the organic nerves, is insufficient to remove them from the frame, or to control their combinations, or to direct them to salutary changes.

118. Before leaving this important subject — important in as far as it involves the fundamental doctrines of disease, and points to rational indications of cure — I may briefly illustrate it by a reference to two or three facts, which are of every day occurrence. It has been long known that affections impeding the functions of the lungs are frequently attended with an increased secretion of bile. This I have shown to depend upon the liver being excited to increased action by the carbonaceous and other elements accumulated in the blood, owing to their elimination by the lungs being interrupted; and thus we readily recognise the cause of the frequent complication of biliary disorder with pulmonary disease, particularly in

some hot countries. In cases, also, where, owing to asphyxia, or to disease, as pestilential cholera, &c., the requisite changes by respiration are not effected in the blood, if recovery take place, the diseased states of the secretions of the liver and bowels indicate that the favourable result has been chiefly owing to the increased performance, under the influence of life, of the functions of these organs. When death occurs from asphyxia, and particularly if it be occasioned by the vapour of charcoal, the black, fluid, or dissolved state of the blood, the presence of yellowish globules like oil, sometimes observed on its surface, and noticed by M. Rayer, sufficiently indicate the changes produced in this fluid, and the influence these changes exert on the chief functions; and if recovery is effected, the evacuations evince that the principal secreting organs have been the means of removing the morbid matters from the blood. A strict enquiry, also, into the changes which precede a favourable termination of the latter stages of malignant diseases, manifestly detects the influence of the secreting and eliminating organs in bringing about this result, and chiefly by their operation, under the influence of life, upon the blood.

119. *b.* That high ranges of *temperature* occasion very important changes in the state of the blood, had been remarked by several of the ancients, and by some of the best writers of the eighteenth century; but the chief mode of its operation was first pointed out in a thesis written by me in 1815. I there showed that increased atmospheric warmth, particularly when accompanied with moisture and miasmal exhalations, greatly diminish the changes effected during respiration on the blood in the lungs; and that the carbonaceous, and other elements and impurities, are imperfectly discharged from the blood through this channel. I further showed, both in that production, and in my physiological notes, that these materials are partly combined to form bile, thus occasioning an increased as well as vitiated secretion of this fluid, and partly excreted by the mucous surface of the intestinal canal, and by the skin; and that, if the functions of these organs, — the liver, skin, and intestinal mucous surface, — which thus compensate the diminished actions in the lungs, be at all impeded under such circumstances, the elements, which they should have eliminated from the blood, necessarily accumulate in it, and influence the functions of the nerves, ramified on the blood-vessels, and of the principal secreting organs and surfaces, ultimately vitiating the blood and all the soft solids of the body, when the vital energies become depressed or exhausted, and the train of morbid phenomena experiences no change tending to health.

120. Thus, we perceive that, during high ranges of temperature, particularly when the air is loaded with miasmata, and the liver is inactive, the elements of the bile will accumulate in the blood, sometimes even to the extent of giving the countenance a darker or more dusky tint than natural, and the blood will be changed, 1st, by the superabundance of the materials whence bile is secreted; and, 2d, by the passage of this fluid, or of certain of its constituents, into the blood, after its secretion has taken place. In the foregoing manner (§ 119.), I explained the prevalence of biliary disorders, particularly bilious cholera, diarrhœa, dysentery, increased secretions of bile; and, in warm climates and seasons, and when vegetable and animal miasms are superadded to this influence, the occurrence of fevers of various kinds — remittent or continued, simple or complicated, biliary or malignant, inflammatory or dysenteric, endemic or epidemic, sporadic or pestilential — according to the circumstances of individuals, the kind of locality, the nature, combination, and source of the miasm, and the state of the atmosphere. This doctrine, now many years since contended for, later experience, and the concurrent opinions of more recent observers, have fully confirmed. (See Fever.)

121. *c.* Several states of disease, which occur in the puerperal state, may be referred to the arrest of the secretions or discharges incidental to it. The secretions from the internal surface of the uterus, and which partly consists of the bloody serum poured into the uterine cavity from the open mouths of the vessels which communicated with the placenta, are not infrequently arrested or impeded. In such cases, the blood does not undergo that salutary depuration which this evacuation occasions; and, consequently, either experiences further disorder, or it creates a disposition in the system to the invasion of other causes of disease. Besides, the fibrinous and albuminous parts of the blood, which are generally in excess during pregnancy, not having been discharged by this route, determine the occurrence of inflammation of the uterus, peritoneum, &c. upon the co-operation of exciting causes. Or, if such causes have produced these diseases, the obstruction or interruption of the secretions and discharges, which is generally thereby occasioned, aggravates the mischief, and the *post mortem* appearances often furnish more or less evidence of the suppression having been concerned in modifying the results; the matters poured out from the diseased parts frequently resembling, or containing constituents of, the secretion which was suppressed. How are we to account for this? We find it demonstrated, that the materials of both bile and urine, owing to obstruction of these secretions, may be mixed with the blood, and give rise to certain well known symptoms. We may, therefore, extend the same principle to suppression of the puerperal secretions; and infer, that the matters which constitute them, having accumulated in, or not been eliminated from, the blood, are discharged along with those effusions of albuminous serum which frequently follow the diseases of this state, even although they may not actually be the causes of these diseases.

122. Graeffe of Berlin (*Rév. Méd.* Jan. 1827.) states, that a female, in a favourable state, and suckling her child, experienced a fright on the eighth day after delivery, which occasioned a complete suppression of her milk. Febrile excitement followed, and effusion took place in the peritoneal cavity and cellular tissue. Upon tapping a few weeks afterwards, a bucket of fluid, resembling whey, and exhaling an acidulous odour, was drawn off. Upon being boiled with dilute sulphuric acid, it furnished a substance resembling caseum. When tapped six weeks afterwards, the fluid was of a greenish yellow, and without the least trace of caseum.

123. That changes in the composition or state of the blood are also followed by alterations of

the natural secretions, is fully shown by both physiological and pathological facts. It is not, therefore, unreasonable to suppose, that modifications or changes of morbid secretions will be occasioned by a similar cause. Indeed, alterations of the latter are quite as likely to be the consequence of pathological conditions of the blood, as changes of the former.

124. *d.* In cases, where the functions of the skin, or of the kidneys, are interrupted, not only are the watery parts of the blood frequently increased, but also various irritating matters accumulate in it, unless eliminated by other organs. These excite more or less disturbance of the whole vascular system; and if the cause continues, or is assisted by concurrent causes, the blood itself becomes very evidently changed, in respect both of the state of its cruor and of its serum. The effects of obstruction of the bile on the blood, and mediately on the tissues, are sufficiently apparent to the sight; and the actual presence of this fluid in the circulation, or, at least, the peculiar matters which characterise it, has been shown by several modern chemists, and completely demonstrated by the recent researches of MM. PROUST, ORFILA, GMELIN, and LE CANU. But it is unnecessary to prosecute the subject further, as I consider that the grand pathological inference, *that the interruption or obstruction of any important secreting or eliminating function, if not compensated by the increased or modified action of some other organs, vitiates the blood more or less; and, if such vitiation be not soon removed, by the restoration of the function primarily affected, or by the increased exercise of an analogous function, more important changes are produced in the blood, if the energies of life are insufficient to expel the cause of disturbance, to oppose the progress of change, and to excite actions of a salutary tendency.*

125. *e.* ILLUSTRATIONS.—The importance of this conclusion will become still more manifest, if we illustrate it by reference to the pathology of fever, and observe the train of morbid phenomena produced by its causes. These, although modified even still more infinitely than the combination of causes in which they originate, present the following almost unvarying characters and mode of procession:—A person exposed to the miasmata generated from vegetable or animal matter in a state of decay, or from persons affected with fever, inhales such miasmata into the lungs, where they produce a morbid impression on the nerves of organic life, followed by depression of the vital influence: the functions of digestion and secretion languish, and, owing to the imperfect performance of secretion and assimilation, the necessary changes are not fully effected in the blood; and thus irritating or otherwise injurious matters accumulate in it. These phenomena generally proceed gradually, until, owing to the continued and augmented depression of the vital powers throughout the frame, and the increasing change in the state of the blood, marked disorder is occasioned. The vascular system becomes excited by the quantity and the quality of its contents; and, when the vital energies are not too far depressed for its production, the excitement becomes general. The accelerated circulation tends still more to disorder the state of the blood; but it also has the effect, in the majority of cases, of exciting the organic functions, of restoring the secretions which were impeded or interrupted, and thereby of removing the morbid state of the circulating fluid; after which the return to health is rapid. When, however, salutary reaction of the vascular system is not brought about, owing to the morbid depression of the vital energy, and to changes which had taken place in the blood; or, if reaction occur, but, owing to the state of this fluid, and of the nervous influence to which it is subject, it is irregular, imperfect, or excessive; the vitiation of the blood proceeds; the secretions are also vitiated; the solids affected; one or more vital organs suffer in an especial manner; the energies of life are exhausted; and various organic lesions are induced, having reference to the previous state of the system, the kind of change produced in the blood, and the agencies in operation during the progress of disease.

126. Such is the general procession and character of the morbid phenomena; and we observe in them certain prominent features, by means of which the various species of fever are recognised. They may be briefly stated to be,—1st, The impression of the causes on the nerves of organic life, the depression of their energies, and imperfect performance of all the functions which they influence: 2d, More or less vascular excitement or change in the state of vascular action, and of the circulating fluid: 3d, Frequently predominance of disorder of some one general system, or vital organ: 4th, Consequent exhaustion, with either a gradual restoration of the functions, followed by a return to health; or more marked vitiation of the blood, of the secretions formed from it, and of the solids of the body, often terminating in organic changes, or death.

127. Here we observe *three* different states of vital action, in each of which the blood generally presents very different appearances. 1st, The *state of depression and invasion* of fever, in which the blood taken from a vein is of a very deep or dark colour; flows with difficulty; frequently occasioning syncope, or great depression upon the loss of a few ounces; and generally coagulates rapidly, and separates into a very dark, large, and soft coagulum, which falls low in the serum—the quantity of which is extremely small in proportion to the clot. Not infrequently the separation is very imperfect, and the coagulum extremely large and soft. 2d, The *state of reaction, or febrile excitement*, in which the blood flows more freely from the vein, and of a brighter colour, occasioning little immediate depression until a more considerable quantity is abstracted; is apparently thinner than natural; coagulates much more slowly, and separates into a somewhat more firm coagulum, than in the former state of disease; and occasionally exhibits a thin fibrinous layer on its surface: in several malignant cases, however, even in this stage, either the separation of serum is very imperfect, consisting chiefly of a deep gelatinous layer, beneath which the colouring matter is deposited in an extremely loose state, and dark colour; or the blood remains imperfectly coagulated, and of a gelatinous consistence. 3d, The *state of exhaustion*, in which the blood generally flows readily; but is uncommonly thin, dissolved or attenuated, and dark coloured; occasions great increase of exhaustion; and either scarcely coagulates, or separates into a remark-

ably loose coagulum, which lies at the bottom of the vessel; the serum varying much as to quantity and colour; being often turbid, clouded, watery, or slightly viscous, and less saline in its taste. Sometimes the coagulum which falls to the bottom of the vessel is so loose, that it appears as a precipitation of the colouring matter, of a very dark colour, and is readily stirred up into the supernatant serum (§ 94. 108.). In nearly all the cases where I have seen blood taken, either in the state of depression or in that of exhaustion, but particularly in the latter, either little or no fibrine could be collected from the coagulum; or what was obtained was scanty, remarkably loose, and even flocculent, and nearly albuminous. Throughout the progress of typhus, the venous blood is generally watery, and without consistence,— a fact to which my attention was called many years ago by the late Professor **Hildenbrand**, at Vienna. In the latter stages of typhoid or malignant fevers, it seems nearly altogether deprived of fibrine. In two or three cases, the blood was abstracted in these states chiefly with the view of examining its appearance. But several instances have occurred to me, in which I have found that blood had been drawn, although the nature of the symptoms, and the state of this fluid, equally contra-indicated the propriety of the practice.

128. With respect to the *post mortem* appearances of the blood in the vessels, I stated, many years ago, when describing the symptoms and morbid appearances of yellow fever, several cases of which I had an opportunity of examining within five hours after death, in the years 1816 and 1817, that it is generally half dissolved, or fluid and grumous, dark coloured, and speedily undergoes complete decomposition. (*Quarterly Journ. of Foreign Med.* vol. ii. 1820, p. 446.) A similar state of the blood has been noticed by **Arejula**, **Bally**, **Palloni**, and others, in the epidemic yellow fever of Spain; and more recently by Dr. **Stevens**, who has described the appearances of the blood in tropical fevers with greater minuteness than his predecessors, has referred to most important changes of the saline constituents of this fluid, and has fully confirmed some very detailed observations adduced by myself several years previously (*Appendix to* M. **Richerand's** *Physiology*, p. 640, *et seq.*), comprising the general results obtained from noting the appearance of the blood in a number of febrile and malignant diseases. Dr. **Stevens** states (*Paper read to the College of Physicians in May* 1830.), that the blood, in these fevers, loses its property of coagulating, becomes more fluid, and thin or watery, of a much darker colour, and has its fibrine and saline ingredients exhausted,— changes which I have ascertained to obtain in a greater or less degree in the fevers of this country, particularly in their latter stages, and have described in my lectures since 1825. (See **Fever**.)

129. Besides other proofs of the diseased state of the blood in fevers, I may adduce the following:—In those who were victims to malignant fevers, **Chirac** found the blood in the ventricles of the heart, and the vena cava, more or less clotted; and all the ramifications of the vena porta were filled with grumous blood. In those who died of typhus, at Brest, in 1757, the blood was found grumous, unnatural, black, and decomposed, particularly in the liver. **Soulier** observed blackish blood coagulated in the vessels; and extremely fœtid black blood in the stomach, of those who fell victims to the plague at Marseilles. **Larrey** found the blood black and liquid in those who died of the plague in Egypt. After intense fevers, **Andral** has found the blood contained in the heart, and in the larger arterial and venous vessels, remarkable for its great liquidity, and its black and deep colour: in some subjects it presented a clear rosy tint, and was like water coloured red; some small fibrous grains were then dispersed over the internal surface of the vessels. In one individual, the liquid contained in the larger vessels was no longer really blood, but a matter the colour of wine lees, sanious in some parts, nearly resembling the ill-elaborated fluid contained in unhealthy abscesses.

130. M. **Bouillaud** found, in two or three cases, the blood clear and rosy, after putrid fevers; but it nearly always appeared blacker and more liquid than in its normal state: this alteration varied, from the degree in which the clot was simply flabby, to that in which the blood formed only a blackened and liquid mass, without any trace of clot. This blood, being put into a basin, was brilliant, shining, and full of micacious specks; in some cases it has been found mixed with purulent matter, or pure pus; at other times it was so altered and disorganised that it resembled a putrid mass. **Bouillaud** justly adds, that in such instances it is not rare to meet with a quantity of gas, more or less considerable, in the circulating canal; and also that, although it be difficult to describe these changes, they should nevertheless be taken into consideration, if we wish to explain satisfactorily the phenomena attendant on putrid fever.

131. The malignant febrile diseases which very frequently attack horses and cattle are always attended with a remarkable alteration of the blood, even early in their progress. These diseases are less frequently met with in this country, than in marshy and warm climates. In some of the most pestilential of those, horses cannot be reared; and when brought into those places, they generally experience a febrile attack, with adynamic or malignant symptoms, and speedily die. This is constantly the case in some parts of Africa, where the vegeto-animal miasms from the soil are abundant and concentrated. I had an opportunity of observing the examination of a horse brought from the interior to an unhealthy situation on the coast, where it died, as all others had done, a few weeks afterwards. It was not much emaciated; but the blood was black, decomposed, fluid, and sanious; and the liver, spleen, lungs, heart, and, indeed, all the internal viscera, softened, ecchymosed, and lacerable with the utmost ease.

132. *C. Contamination of the blood by putrid or septic matters applied to the tissues.*— These substances were not inappropriately said, by the older writers, to occasion a putrid ferment in the part to which they were applied. The ferment may be disputed, but that they produce change of the blood is undeniable. If we examine the subject closely, we can arrive at this conclusion only,—that the substance applied changes the part to a state somewhat similar, as respects sensible properties, to itself; and that this contamination soon extends, either by its immediate effects upon

the organic nerves supplying the vessels, and consecutively on the blood, or by the direct introduction of the contaminating matter into the divided vessels, or by its imbibition or absorption, or by one or more of these channels, to the whole body, affecting, more or less, the blood, the secretions, and the solids. That these changes take place is undeniable, although the precise channel of primary infection cannot be easily demonstrated; and is sufficiently proved by the facts already adduced (§ 92.), and by those which follow (§ 133.). The instances of gangrenous or diffusive inflammation of the cellular tissue, arising from contact or inoculation of putrid animal matter, as recorded by numerous writers, and recently by Drs. BUTTER and DUNCAN; the not infrequent instances of it from injury in the dissecting-room (see CELLULAR TISSUE, *Diffusive Inflammation of*); and the occurrence of putrid fever, with gangrenous pustules and carbuncles, particularly amongst farriers, flayers, and knackers; furnish proofs and illustrations of the blood being one of the chief, although, perhaps, not the primary or only, channel through which the whole frame becomes more or less infected in a large and important class of diseases. A most remarkable instance of this, and at the same time showing to how great an extent the fluids and solids of the body may be contaminated, and yet the patient recover, is recorded by M. GENDRIN.

133. A flayer was affected with putrid fever, and gangrenous pustules and carbuncles. His breath, evacuations, and whole body, were horribly fœtid; and blood taken from a vein was, three hours and a half after its emission, unusually dissolved and black; and gave out an odour resembling that of putrid flesh. A spontaneous discharge of a black, dissolved, sanious blood, also occurred from his mouth and nostrils. M. GENDRIN introduced some of the blood taken from the arm of this person into the cellular tissue of a cat, and into the femoral vein of a dog. Both animals evinced symptoms of putrid fever, and died in a few hours. The blood throughout their bodies was dark and fluid; the heart soft and flaccid; the viscera congested, and ecchymosed with dark spots, and speedily began to exhale a fœtid odour. M. GENDRIN also details some experiments, in which he injected into the veins of different animals, the blood of persons affected with confluent small pox. Very violent effects, rapidly terminating in death, followed; and, upon inspecting the bodies, several viscera were found highly inflamed and congested.

134. *D. Contamination of the blood from causes influencing the state of the vascular system, either directly, or mediately through the nerves which supply it.* — Under this head may be comprised a very numerous class of causes: and, indeed, many of those which were alluded to in preceding sections may also act in this way. *a.* Infectious and contagious miasms and secretions may change the state of the blood in a more or less direct manner, as well as by first affecting the organic nervous system generally, and thereby impeding or changing the action of vital and secreting organs. Inordinate acceleration of the circulation appears to be frequently followed by serious alterations of the blood. The experiments of M. DUPUY on several animals show that the fibrine is either very much diminished, or otherwise changed, by their being coursed or hunted; as the blood remains fluid, or becomes dark coloured and grumous subsequently: M. CHAUSSIER found that a portion of blood altered by this cause produced gangrenous pustules and malignant fever, when inserted into the cellular tissue of sound animals; and the striking instance recorded by DUHAMEL, and already alluded to, further proves that a morbid state of the blood is occasioned by overdriving animals. HALLER and BUCHNER remark, that vehement exertion renders the urine fœtid, acrid, and scalding; the perspiration fœtid and disagreeable; the blood very fluid, acrid, and vitiated; and, if long continued, occasions most ardent fever, terminating rapidly in death, and dissolution of the fluids and solids. HALLER refers to two cases where he observed these effects produced by intense acceleration of the circulation by running; and adds, that the blood of hunted animals is often not only fluid, but fœtid; the flesh becoming quickly putrid. The attenuation and subsequent alteration of the blood observed in ardent or other fevers, attended with inordinate vascular action in their early stages, and the ecchymosis, petechiæ, softening of the mucous tissues, &c. may doubtless be attributed, in part, to the rapidity of the circulation, or increased motion to which it is subjected. If we continue to agitate healthy blood as it flows from a vein, it becomes thinner than natural, a small portion of fibrine collects around the stick with which it is stirred, and the blood remains fluid, as must be familiar to every one, and long since demonstrated by SCHWENCKE.

135. *b.* If any of the neutral alkaline salts, particularly those with excess of base, be added to blood as it is discharged, the coagulation will either be entirely prevented, or imperfectly produced; little or no fibrine will be formed, and its colour will become more florid. These facts have long since been noticed by VERHEYN, ELLER, RUTTY, HALLER, &c. The injection of acids, or the metallic salts, particularly those with any excess of acid, render the blood dark coloured, and changes it into a grumous fluid, from partially coagulating its albumen and fibrine. The experiments of ELLER, GIANELLA, DUHAMEL, FRIEND, COURTEN, RUTTY, DE HEYDE, SPROEGEL, AALSEM, BORRICH, PETIT, and various others, prove this effect; and further show, that when these substances are added to blood taken from a vein they either accelerate its coagulation, rendering the coagulum firm; or, if strong solutions are employed, the coagulation is irregular, the separation of the watery portion is more perfect, and the coagula are of a dirty black or dark brown colour. The attenuating effects of the fixed and volatile alkalies, and of their subcarbonates, both upon the blood and the secretions formed from it, particularly when long employed, will be considered as proved by any one who will peruse the experiments of SCHWENCKE, FRIEND, ELLER, RUTTY, COURTEN, PITCAIRNE, THACKRAH, and SCUDAMORE, without the bias of system; and they are confirmed in my mind by some observations I have made of the results when these substances are mixed with blood immediately after venæsection, or when exhibited internally in large doses for some time previous to abstraction of the blood; whilst directly opposite effects are observed to follow the internal use of acids. In the

latter case, the coagulum is firm, the blood of a deep or dark colour, and the fibrine abundant: in the former, the blood is thin, of a brighter colour, the coagulum much less firm, and the quantity as well as the cohesion of the fibrine diminished.

136. The effect of the fluid extract or tincture of opium, alcohol, tonic or astringent tinctures, and of spirits of turpentine upon the blood, is to increase its coagulability; and, when injected into the veins in sufficient quantity, to produce death, as in similar experiments with acids and the metallic salts, chiefly from this mode of operation. The experiments of COURTEN, FRIEND, YOUNGE, SCHWENCKE, DE HEYDE, SPROEGEL, SILBERLING, and FONTANA, fully prove these facts. The accuracy of the results as to one of these substances has been confirmed by the experiments of the writer. That both alkalies, acids, and salts, act upon the system chiefly from their being absorbed and carried into the blood, has been satisfactorily demonstrated by MAGENDIE, TIEDEMANN and GMELIN, MAYER, WESTRUMB, and various others, and will not be now doubted, although the active exercise of the eliminating functions, which their very presence in the blood generally promotes, prevents their accumulation there to any considerable or deleterious extent, unless they have been taken in poisonous doses. They have, nevertheless, been absorbed in such quantity as to be detected both in the blood and in the various secretions by means of chemical agents, as demonstrated by MM. GROGNIER, CHAUSSIER, ORFILA, and by BUCHNER, KRIMER, BENNERSCHEIDT, SCHUBARTH, and Dr. O'SHAUGHNESSY.

137. *c.* The interesting researches of MM. GASPARD and MAGENDIE, in order to ascertain the effects of *putrid vegetable* and *animal matter* when introduced into the cellular tissue or injected into the blood, further illustrate the importance that is to be attached to morbid states of this fluid, as well as the origin and nature of various diseases. These physicians have fully proved that such substances, when thus employed, produce symptoms very similar to those of yellow fever, and typhus; and that, after death, this fluid is found remarkably altered, being nearly altogether fluid, of a very dark colour, and partially exuded from the capillaries, both into the parenchyma of the viscera, and from the mucous surfaces. That the blood is really altered in its nature by this inoculation, is proved not only by those changes, but also by the circumstance of its having lost the power of coagulating upon removal from a vein soon after it has been thus infected, and by its speedy putrefaction. The more recent experiments of MM. LEURET and HAMONT furnish the like results; whilst those performed by M. MAGENDIE show that dogs confined over, and breathing the effluvium proceeding from, animal and vegetable matters undergoing decay, experience similar symptoms to those now referred to, and the same alterations of the blood, of the secretions, of the excretions, and of the viscera, as observed in yellow fever: and, in all these cases, the morbid changes also extend more or less to the soft solids, and particularly to the mucous surfaces, the lungs, the liver, the heart, &c.

138. A most interesting fact has been stated by M. LEURET, and one which fully illustrates the views I have entertained respecting the nature of certain forms of *puerperal fever.* This physician injected some blood from an artery of a living horse affected with gangrenous boils (pustule maligne) directly into the veins of a mare five months with foal. She died five days afterwards. The heart, lungs, and intestinal canal were studded with dark ecchymoses, the uterus was gangrenous, and the blood dissolved and dark coloured. But, in all the cases where poisoning has resulted from the injection of septic or putrid matters into the circulation, or from virulent and rapidly fatal poisons, it must not be overlooked that, although the more manifest lesions are often observed in the blood, the injurious agent affects also the organic nerves terminating in the vessels, and consequently the vitality of the vessels themselves, altering the blood they contain, and thereby ultimately contaminating all the secretions and solids of the body; and that the mode of operation of the greater number of these septic agents, whether applied in an aggregate or palpable form, or from being dissolved in the moisture of the air, is very different from that of the saline and mineral substances considered above, which affect the blood more especially. (See INFECTION.)

139. *d.* The direct influence of the nervous system upon the blood was long since contended for by BARTHEZ, and admitted by several physiologists. The chief error, or rather mischievous fallacy in their theory, however, being, that this influence was imputed to the cerebro-spinal nerves, and not to the ganglial nerves, to which it almost entirely belongs. This great mistake also vitiates the opinions promulgated on the subject by Mr. BRODIE and Dr. W. PHILLIP. The opinions, which I have entertained, and frequently expressed, that the power exerted by the nervous system on the blood is limited to the organic or ganglial class of nerves, and that their functions are very distinct from those performed by the cerebro-spinal class of nerves, the influence of the former having been too generally and erroneously imputed to the latter, have been already alluded to. Since their promulgation many years ago, numerous proofs of the accuracy of these views have been furnished in different countries. That the effects produced by the organic nerves take place chiefly in the minute vessels may be safely assumed; and that a reciprocative influence is exerted by the blood upon these nerves will not be denied: but it may also be inferred that the effects produced by the organic nerves are not limited to the small vessels. Professor MAYER's experiments support this opinion. He found that, when both pneumogastric nerves were tied, the blood coagulated in all the pulmonary vessels, the colouring matter having separated from the fibrine; and that this change was not the consequence of death, but its antecedent, since it was uniformly found upon opening the bodies the moment they expired. M. DUPUYTREN had previously ascertained, that a simple division of the pneumogastric nerve prevented the venous from being converted into arterial blood in the lungs.

140. M. DUPUY found that, when the pneumogastric nerves were divided in the cervical region, in horses, the quantity of fibrine in the blood became progressively diminished to a very

remarkable extent; and that a similar result followed laborious breathing in disease. He further states, that the blood throughout the animal was entirely dissolved after the pneumogastric nerves had been divided; and he adds that, when a portion of this blood is injected into the jugular vein of another horse, a gangrenous affection is produced (§ 92.). But these effects are comparatively slow; for in order that they may take place, the division of these nerves must previously affect the ganglia and plexi supplying the lungs and heart, and with which they are in intimate connection. When, however, these ganglia are immediately impressed, the effect is much more rapid. Such impression cannot, however, be readily made upon the ganglia themselves, owing to the protection their situation affords them from experiments of a conclusive kind. But as we find that agents, which do not affect the system when applied to the voluntary nerves, or the brain itself, will act rapidly when brought in contact with parts which are especially provided with the other class of nerves, and manifest the effects of this mode of operation upon the parts more immediately influenced from this source, we must necessarily conclude that the morbid impression of poisonous substances is primarily exerted upon the latter, and not upon the former; and hence the rapidity of their effects upon the blood, — effects which are productive, no doubt, of most important consequences throughout the economy, which I am endeavouring to estimate fully and fairly, but which should not altogether obscure our perception of earlier changes, which alone can account for all the phenomena. A severe blow over the cœliac ganglion will produce instant death, and the blood will remain dissolved, and exhibit the same appearances as after death by lightning and the most virulent poisons. Here we can attribute these remarkable changes only to the sudden concussion, and annihilation of the influence exerted by this important part of the organic or ganglial class of nerves — by this central source of vital power, upon the vascular system, and to the effect thereby produced upon the blood.

141. Seeing, therefore, that the organic or ganglial nerves are chiefly distributed to the very internal membrane of the blood-vessels for the purpose of transmitting their vital influence to the blood itself, it must be inferred that, although various substances or poisons may seem to act more particularly and immediately upon the blood, and others more directly on this class of nerves, according as they are applied within or without the vessels, the action cannot be restricted to either; for whatever changes the state of the one, must affect the other. That poisons, when introduced into the blood, will have an almost instantaneous effect, but not in the manner usually explained, may be readily granted and accounted for. The views upon the subject frequently stated by the Author in the Medical Repository, and in his Physiological Notes, seem more in accordance with the resulting phenomena; and are moreover confirmed by experiments and observations recently made by others; for when the poison has been applied to the cerebro-spinal nerves, it has been found by Orfila, Fontana, and others, to have no further operation, or even less, than when applied to other tissues, because it is not directed to that particular organisation, upon which the functions of life more immediately depend. But when injected into the blood, it is applied to the terminations of the organic nerves in the blood-vessels — to that particular quarter where the life of the tissues and of the blood is either generated or supplied, — to the seat where the influence of these nerves affects, even if it does not vitalise, the circulating fluid, and the operation is instant and most manifest. The reader, who, possessing an intimate acquaintance with the healthy relations of the organic nerves to the blood-vessels on the one hand, and to the cerebro-spinal system on the other, examines the numerous experiments which have been performed, — by one class of experimenters to show the action of poisons upon the nerves, confounding, as all have done, the ganglial with the cerebro-spinal nerves, — and by another class to demonstrate the operation of these substances on the blood solely, both sides leaving reciprocity of action, or rather the rapid change occasioned by one system on the other, too much out of the question; and is able to detect the fallacies with which they nearly all more or less abound, chiefly from confounding distinct functions, and even different systems, with one another; will entertain but few doubts that the influence of various poisons, although more manifestly indicated in the blood, is chiefly exerted upon the nerves which terminate in the blood-vessels; and that the alterations in the contents of the vessels arise principally from previous changes produced upon these nerves, however rapid the succession of the phenomena may be.

142. The celebrated and accurate experiments made by Fontana on the venom of the viper and the ticunas can be justly estimated only in accordance with this view; for when these substances were applied to the cerebro-spinal nerves no more rapid effect was produced by them than upon any other tissue: but, when injected into the veins, a fatal result was almost instantaneous; the blood, in the words of this able experimenter, being suddenly changed to a livid black, and soon afterwards coagulated in the lungs, heart, auricles, and liver, as well as in the large veins, with violent disease of the structure of the lungs. Now, as these substances, when added to blood as it is drawn from a vein, preserve its fluidity, they must produce, on the organic nerves ramified to the blood-vessels, a most intense effect; the alteration in the blood resulting evidently from antecedent change in the vital influence of these nerves, since no such alteration is occasioned by them when added, even much more abundantly, to blood as it flows from a vein. And there can be no doubt that virulent poisons introduced into, or having access to, blood contained in the vessels of a living animal, however the vessel may be insulated from surrounding nerves, must come in contact with its interior, and thus have an occasion given them to act upon the independent class of nerves which is especially devoted to the blood-vessels. That the very instant and intense effects which I have, in three instances, seen produced upon the blood of the human subject from the bites of serpents, and which have been minutely described by Orfila, Fontana, and many others, cannot arise from the diffusion of the poison in the blood, must be evident from the rapidity with which they occur, but

rom the morbid impression made by them upon the vital or ganglial nerves, and instantly propagated throughout the frame; the effects of this impression first appearing as a manifest lesion in the part where the injury was inflicted, and in the blood, which, as a part of the vascular system, is co-ordinately affected with the class of nerves supplying both it, and the vessels which contain it, with vital influence. From the mode of operation, therefore, of all the most virulent poisons, as prussic acid, the venom of the viper, ticunas, &c., I infer, that, as the organic system of nerves may be intensely affected, without altering the state of the brain more than that of any other important organ, and then secondarily merely, so may those poisons destroy life by their effects upon this system of nerves primarily and chiefly, other lesions being consecutive, amongst which the alteration of the blood is the next most immediate, and the next most important in its relations and consequences. (See Poisons.)

143. *E. The passage into the blood of morbid matters formed in the same body that is the seat of disease*, has been particularly noticed in the articles on *Absorption* and *Inflammation of Veins*. I have shown, when treating of these subjects, as well as of certain organic and malignant diseases, that vitiation of the blood, and ultimately of the soft solids more or less, is a very frequent occurrence; that it is hastened or promoted by depression of the vital energies; and that this fact, as well as the vitiation of the blood, should be taken into account in treating these maladies, particularly in their more advanced stages. It is probable that morbid matters may sometimes exist in the blood without very materially affecting its condition; but they much more frequently occasion very important changes in its constitution, as must appear from what has been stated, particularly when the powers of life begin to languish. *Pus* has been often detected in the veins which convey blood from parts undergoing the suppurative process, both by the older physicians and by recent writers, particularly Bichat, Fizeau, Velpeau, Rochoux, Gendrin, Andral, Dance, Breschet, and Ribes; and it seems very probable that, when thus absorbed, and not mixed with, or eliminated from, the circulation, it gives rise to various changes of the blood in the vessels, not only from attracting the fibrinous corpuscles in the manner already noticed (§ 85.), but also from combining with albuminous or other constituents of this fluid. I further believe, that the sanies which flows from chronic ulcers, or from the inside of veins when affected with spreading inflammation of their internal surface (see Veins.), and from the internal surface of the uterus in certain states of puerperal disease; and that the tubercular and encephaloid matter which often forms in internal viscera; may all be carried into, and most sensibly affect, the circulating fluid, and, through it, all the functions and structures of the body.

144. M. Andral states, that he has often found in the blood-vessels, instead of blood, a curdy friable matter, of a dirty grey colour, and resembling either the semi-concrete pus of chronic abscesses, or the sanies of malignant ulcers, or encephaloid matter broken down and mixed with blood; and similar instances are recorded by Bichat, Béclard, and Velpeau. In all these cases, abscesses, tubercles, or other morbid formations, also existed in some part of the body. (See arts. Absorption, Abscess, &c.) In many of such cases, it is difficult to determine what may have been the state of the general mass of blood in the latter stages of the disease, owing to the period which had elapsed from the dissolution of the patient to the examination; but it is very probable that the morbid matter found in the vessels had materially affected, either directly, or mediately through the organic nerves, the constitution of the whole fluids and soft solids of the body.

145. iv. Phenomena materially depending upon a vitiated state of the Blood, and serving to indicate its existence.—I have contended that the functions of depuration are very frequently concerned in occasioning, as well as in removing, a morbid condition of the circulating fluid. These functions will, therefore, evidently present some modification, when performing this latter purpose, inasmuch as the state of the blood, and of the impurities requiring change and elimination, will excite in them, as well as throughout the soft solids, more or less disturbance. In the slighter cases, the disorder of function will be less apparent; but even in these, and still more remarkably in the more severe cases, the particular function most disturbed will generally evince some relation to the kind of change existing in the blood. This relation of the change or impurity of the blood to the functions of viscera is very similar to the mode of operation and effects of very many medicinal substances, which, having been carried into the circulation by the function of absorption, act upon particular organs according to the circumstance of their exciting or otherwise changing the vital condition of these organs, while they are being circulated through or eliminated by them.

146. As respects, however, this relation of the pathological states of the blood, much requires to be ascertained, or rather but little is yet known beyond a few facts evincing that such relation sometimes actually exists. Thus we observe that excess of carbonaceous elements in the blood is removed chiefly by means of the liver, occasioning an abundant and vitiated secretion of bile. We may frequently remark, that an imperfectly elaborated chyle, or the partial absorption of sordes from the intestinal canal, renders the breath fœtid, and the urine loaded, or otherwise changed; that accumulation of the materials usually eliminated by the kidneys produces copious urinous perspirations, and the exhalation of a copious fœtid halitus from the lungs; and that putrid vegetable and animal matters, or morbid secretions carried into the circulation, derange the digestive mucous surface, and secreting organs, in a somewhat greater degree than other parts.

147. *A.* It obviously becomes most important to enquire if the phenomena resulting from change in the blood slowly brought about, or proceeding from pre-existing disease of important functions are different from, or are nearly the same as, those which arise from the introduction of putrid or morbid matters directly into the circulation. We observe in the last stages of malignant diseases, when the blood undoubtedly becomes changed, that all the secretions are remarkably offensive, acrid, and even excoriating. The breath, per-

spiration, urine, and stools, are fœtid; and the surfaces and parts with which the secretions and excretions come in contact, experience more or less change in their vital actions, and are disposed to undergo rapid disorganisation. All the circulating and secreted fluids have acquired septic and irritating properties; and discharges of sanguineous, or black, grumous, fluid matters sometimes take place from the digestive canal. The whole soft solids also lose their vital cohesion and tonic contractility, and are rapidly destroyed upon accidental injury and pressure. Hence the frequency and severity of the excoriations, ulcers, and sphacelating sores, which affect the prominent parts, sustaining the weight of the body in bed; and to this cause, in some measure, are to be imputed the ill effects sometimes following the use of blisters in the last stages of adynamic diseases. The whole surface of the body and countenance also present more or less of the characters which distinguish change of the other structures from this all-pervading cause: they lose their vital and animated hue, and become lurid, murky, or of a dirty pale tint; in some cases of a dirty or muddied pale yellow; in others slightly livid, or even altogether purplish; and in many instances, besides assuming a lurid and unhealthy colour, they are dotted with petechiæ, ecchymoses, and blotches of various shades, from a reddish tint to a reddish brown and deep purple. In numerous cases, particularly in the last stages of yellow fever, the skin is of different shades of yellow, frequently disposed in large patches, some of which are deeper than others, but the whole surface being more or less changed from its healthy tint. All these appearances arise from the state of the colourless parts of the blood, transmitted by the minute vessels of the integuments; and the admission, where ecchymosis, &c. occur, of colouring matter into vessels which did not circulate red blood in health, and the extravasation or escape of minute portions of a reddish serum, or attenuated or semi-dissolved blood, from the pores or extremities of the capillaries of the *rete mucosum*, — a change, however, which is not limited to the teguments, but which often exists still more remarkably in the mucous and submucous surfaces, and parenchymatous organs. (§ 149.)

148. *B.* The rapid or direct introduction of vegetable or animal putrid matter, purulent sanies, or animal poisons, into the circulation, generally occasions, not only changes in the blood, destroying its property of coagulating, and imparting to it a tendency to quick decomposition, but also most intense disease of the principal organs: — *a.* The nervous centres are remarkably impressed, giving rise to great prostration of strength, delirium, convulsions, or death, according to the intensity of the cause: — *b.* The digestive organs are affected by vomiting of morbid, brown, grumous, or other fluids; with purging of sanguineous, dark, putrid, or black matters; or distended with fœtid gaseous secretions: — *c.* The respiratory and circulating functions are remarkably deranged — the respiration is quick, difficult, or panting; the action of the heart quick, weak, or fluttering, and the impulse deficient; and the pulse, at first full, open, broad, and unusually soft and compressible, soon becomes uncommonly quick, weak, and ultimately small, thready, or fluttering: — *d.* General disease of all the functions and soft solids, accompanied with speedy death when the cause is intense; but, with the symptoms of adynamic, typhoid, or putrid fever, when acting more slowly, or to a less extent, and occasioning sphacelation or gangrene of various parts, gaseous exhalations or secretions, and various serous, sanguineous, or sanious exhalations and infiltrations.

149. *C.* The effects upon the fluids and soft solids have been already mentioned incidentally, and may, indeed, be inferred from what has been stated. These chiefly consist, *a.* Of a fœtid, decomposed, remarkably morbid, acrid, and dark or unnatural colour of all the secreted fluids: *b.* Of diminished cohesion of the tissues generally, but most remarkably of the mucous, cellular, muscular, and glandular parts, — the heart is soft and flaccid, the blood dissolved, and the internal surface of the heart and blood-vessels tinged of a more or less deep red colour, owing, as M. Trousseaux has fully proved, to the altered state of the blood; the muscles are easily torn, the mucous and cellular tissues are soft and pulpy; all the structures have lost their vital and physical elasticity, and they all undergo decomposition more rapidly than usual: *c.* Congestions, infiltrations, extravasation, &c. of fluid dark blood into the parenchyma of the lungs, liver, kidneys, and into the cellular, mucous, muscular, and other parts, with gangrenous spots, and a fœtid odour.

150. Such are the consequences of putrid or morbid matters conveyed into the circulation, and the results, in respect both of the phenomena, and of the remote organic lesions, of changes produced by these matters in the constitution of the whole fluids and structures of the body. When these matters are in a less concentrated state, or enter the circulation in a more gradual manner, they will then act in a relatively slower and less intense form, and their effects will more nearly approach those described as consequent upon a diseased state of the blood in malignant fevers (§ 125—130.). Yet their operation will still retain nearly the same distinctive characters, the symptoms varying chiefly in degree, but not materially in kind, unless the nature of the cause has also varied. Whether we contemplate, therefore, the character and progress of the phenomena following infection of the blood from these various sources, or the nature of the lesions which ultimately result, we shall be equally struck by the marked similarity existing between them.

151. That the blood is changed in various other maladies, although to a much less extent, may be inferred from the phenomena which are observed either essentially or contingently in their course. The secondary fever in small pox is apparently connected with the partial absorption or the more fluid parts of the matter contained in the pustules, and the change thereby produced on the blood, and through it upon the economy. Instances have come before me, where, upon the rapid disappearance of the small pox eruption, purulent matter was secreted suddenly and in large quantity in the capsules of the joints, and without any previous or coexistent inflammation of these parts. In such cases the purulent matter had evidently passed through the current of the circulation. (See Abscess — *Consecutive*, and Absorption.) Similar occurrences are not un-

frequent in cases of inflammation of veins, and in puerperal metritis. (See VEINS, &c.)

152. v. THERAPEUTICAL INDICATIONS AND MEASURES IN DISEASED STATES OF THE BLOOD. — The facts and observations now adduced in illustration of the *pathology of the blood* must appear sufficient to attract greater attention to the state of this fluid in the treatment of diseases, than has been directed to it in modern times. However scanty well ascertained facts connected with this subject may seem, they are at least sufficient to justify us in directing our means of cure to the removal of those changes which may be presumed to exist in this fluid. This indication is the more safely entertained, as those means are often at the same time the most efficacious in removing pre-existing or concomitant disorder of the nervous or other systems of the frame. And it should not be overlooked, in our anticipations of the benefit resulting from curative indications founded on these views, that the most certainly beneficial means of prevention and cure of a most dangerous disease admitted to depend chiefly on the blood, viz. scurvy, is a remedy which acts principally on this fluid, — the citric acid.

153. There are certain facts, which a review of the foregoing observations will lead us to entertain as useful data for our guide, both in the recognition of changes in the blood, and in devising means for their treatment. It will be apparent from what has been adduced, that remarkable diminution or exhaustion of the vital manifestations of the organic nerves, or of the vital energy generally, renders the blood dark coloured, prevents its fibrinous particles from adhering into a coagulum when removed from the vessels, disposes the colouring matter to separate from their central corpuscles, and occasions a diminution of its saline ingredients. The effects of various matters, vegetable, animal, and mineral, when gradually and circuitously conveyed, or directly introduced, into the blood, have been particularly described, not merely as evidence of the very important changes produced by them on this fluid, but also as furnishing indications for the removal of similar alterations, when they are the results, immediate or remote, of diseased actions.

154. *A. Treatment of blood abounding with fibrinous and albuminous constituents — of buffy blood, &c.* — In various diseases, particularly those which are inflammatory, in the early stages of the exanthemata, especially in certain epidemic occurrences of these maladies, the blood abounds in these constituents; and hence partly the copious albuminous and fibro-albuminous exudations which are thrown out by the blood-vessels in their progress. The knowledge, which we have already obtained as to the effects of certain substances on the blood, indicates the propriety of having recourse to such as possess the property of diluting and attenuating these constituents, at the same time that they diminish the vascular action which is instrumental in secreting them; and experience fully proves, by its success, the propriety of the treatment. Blood-letting, and afterwards the free use of diluents holding in solution the alkaline carbonates and salts, more particularly cream of tartar and borax, or the tartarized antimony; and digitalis, large doses of calomel, or other substances which have been shown to produce an attenuating effect upon the blood, are especially indicated. Blood-letting in those cases is of the utmost service, as it diminishes general action, and removes a portion of the fibrine and albumen which are replaced by the thinner fluids absorbed from the prima via and tissues.

155. *B. Treatment of blood with a loose coagulum, &c.* — Rapid coagulation and deficient adhesion of the clot have been shown to arise from weak nervous influence and vascular action; and indicate the propriety of having recourse to stimulating tonics, particularly when the smallness of the coagulum, and whey-like, milky, or turbid state of the serum, evince a poor and imperfectly elaborated blood. In this case, chalybeates, the sulphate of quinine, and the more permanent tonics, with the mineral acids, and the metallic salts, are especially required. When, in addition to this state, the blood is of a very dark colour, the combination of stimulants with tonics and the alkaline salts, especially the chlorides of potash or soda, will be found most advantageous. In cases of this description, however, the preparations of ammonia, excepting the muriate and acetate of ammonia, although stimulating, will not be found so serviceable as other saline preparations. When, however, the muriate and acetate of ammonia are combined with excess of acid, the use of them will be advantageous. Camphor, serpentary, and arnica, the essential oils, the turpentines and balsams, are all beneficial in this state of the circulating fluid.

156. *C. The treatment in other morbid states of the blood* will necessarily vary according to the particular appearances it may present.—*a.* When the blood coagulates imperfectly, is dark coloured, is readily decomposed, or is thin and dissolved as in scurvy, and various malignant and adynamic diseases, especially when the vital cohesion of the tissues is also impaired, the use of most of the remedies recommended above (§ 155.), particularly the chlorides, the preparations of bark, antiseptic wines, the oil of turpentine, camphor, the chloric and muriatic acids, with vegetable tonics, the nitro-muriatic acid, vinegar, citric acid, &c. The influence of *acids* in restoring the state of the blood, particularly when morbidly attenuated, and deficient in fibrine, appears to have been well known to the ancients, and the indications thereby offered put in practice. Vinegar was adopted by the Carthaginians and Romans in all their campaigns as the chief beverage, as may be gathered from VIRGIL, MARTIAL, PLINY, GALEN, &c.; and its advantages have been adverted to in modern times by LINNÆUS. There cannot be a doubt that both it and citric acid are particularly serviceable in preventing the attenuation, and tendency to dissolution, of the blood generated, as has been shown, by excessive fatigue and exertion, — causes which have often been proved (§ 134.) powerfully to concur with unwholesome food, and vegeto-animal miasms, in the production of scurvy, dysentery, and typhoid fevers. It appears that the scurvy, which was found so destructive in Admiral Anson's fleet, was in no small degree promoted by the excessive labour of the men at the pumps, — a species of exertion which tends more than any other to accelerate the circulation, and exhaust nervous power, and consequently to produce a dissolved and incoagulable state of the blood, and to dimi-

nish its fibrine. When, however, the blood is morbidly thick and carbonaceous, when the respiratory functions are imperfectly performed, and when there appears to be a deficiency of saline constituents in the blood, as in the advanced stages of fevers, the fixed alkaline salts, and chlorides, are much to be preferred to acids.

157. *b.* Since the general neglect into which the humoral pathology has fallen, *antiseptics* have almost been discarded from practice; at least, medicines have seldom or ever been given with an intention of preventing a tendency in the fluids and solids to dissolution. It must have been long known to every person who considered attentively the operation of remedies on the frame, that many of them, either directly or indirectly, produce this effect, in conjunction with other operations; and that they act in this manner, 1st, by exciting the organic nerves, and increasing the vital cohesion of the tissues, to which they are immediately applied; and, 2dly, by their passage, to a greater or less extent, into the circulation, and operation on the blood itself, and, through its medium, on the nerves supplying the vascular system, and on the structures generally, — the antiseptic effect being the sum of those actions. Amongst the various antiseptic remedies with which we are acquainted, there is none more energetic than the chlorides or chlorurets, the spirits of turpentine, camphor, the barks, mineral and vegetable acids, the spices and aromatics, metallic, earthy, and alkaline salts, spirits, and balsams; and observation has proved to us, that these are actually the means which, when appropriately employed, are most successful in removing morbid states of the blood, secretions, and solids. Needham and Paulet found salt most successful in combating an epizooty characterised by a morbid state of the blood; and I had an opportunity of ascertaining that, without a necessary supply of this substance, the natives of the more insalubrious districts in intertropical Africa are carried off in great numbers by a putrid and liquescent dysentery, for which salt, lime-juice, and cayenne pepper are their principal means of cure. It should, however, be remembered, that all stimulants are not also antiseptic in their operation on the blood. The preparations of ammonia have even an opposite effect, unless the muriate combined with an excess of acid.

158. *c.* During the treatment of all diseases in which the blood becomes more or less changed, it will be requisite to have strict reference to the causes from which the change has arisen. Unwholesome food, vegeto-animal miasms, imperfect secretion and depuration, and deficient nervous and vital power, have been shown to be the chief of these. That the first and second of these should be avoided, need not be stated; and that the secreting and eliminating functions ought to be promoted, in order to purify the blood, is equally manifest. The nervous and vital energies must be not only supported, but also promoted and excited, in order that the power of secretion may be afforded to the torpid and weakened viscera; and that the crasis and vital condition of the blood may be thereby restored, and the tonicity of the capillaries, and of the tissues generally, be increased. In addition to these, also, morbid secretions should be frequently evacuated, in order that vital power may not be further reduced by their morbid impression on the nerves and mucous digestive surface, and that the possibility of the absorption of any part of them into the circulation may be thereby avoided. But, in carrying this indication into execution, care ought to be had as to the measures which we employ. Gentle means are generally requisite, as rhubarb, &c. But those substances, which, with an aperient operation, possess also a stimulating and antiseptic operation, as the oil of turpentine, should be selected; or, if other substances be preferred, they should be combined with tonics, antiseptics, and stimulants. Formulæ 266. 437. 572. in the *Appendix*, are good examples of this combination.

159. *d.* In all the alterations of the blood resulting from the introduction or absorption of morbid matters from parts previously diseased, whatever tends to lower nervous and vital power, or to promote absorption—more particularly blood-letting, which operates in both these ways — ought to be guarded against, and a diametrically opposite plan of cure adopted; not neglecting at the same time the promotion of the depurative and excreting functions.

160. *e.* In diseases where it seems evident that the watery and saline parts of the blood are drained off, by the continued exudations from the mucous surfaces, as in cholera, particularly epidemic cholera, diarrhœa and dysentery attended by dangerous symptoms, much advantage might accrue from the injection of warm water into the veins, holding a very small proportion of saline matter, particularly the muriate and sub-carbonate of soda, with a minute quantity of some mild stimulant and astringent, in solution; care being taken that the latter ingredient be not in nearly such quantity as to affect the albumen of the blood. Spirit of wine, ammonia, sulphate of quinine, &c. may be thus employed. (See Poisons, for *treatment of Poisoning of the Blood.*)

161. *D. Prophylaxis, or the prevention of morbid states of the blood.*—The extended enquiry which has been entered into respecting the causes of the alterations which take place in the blood, furnish the chief indications for preventing their occurrence. The primary influence of the organic nerves upon the blood, and the effect rapidly produced upon this fluid by a diminution or vitiation of this influence, having been conclusively shown in respect of changes directly produced by this class of nerves, both on the blood circulating in the vessels, and on the functions of secretion and depuration, it becomes a matter of the first moment to preserve the vital manifestations of this important part of the nervous system from experiencing depression or exhaustion; especially where causes having this effect are in operation, and where there is any risk of those morbid matters, which have been shown in this article to be the chief sources of vitiation, being carried into the blood; particularly those vegeto-animal, or animal effluvia, which, floating in a moist atmosphere, act both by depressing these vital manifestations, and by infecting the blood itself. Persons exposed to those sources of disease should live on a due proportion of farinaceous and other vegetable substances, with a moderate proportion of fresh animal food, and preserve the energies of the digestive and assimilating organs; always attentively promoting the functions of secretion, depuration, and excre-

tion. At the same time many of the substances mentioned above may be employed as beverages, condiments, or preventives; more particularly the medicines formerly denominated antiscorbutics, the citric acid, lemons, lemon-juice with sugar; vinegar in which the warm spices, as capsicums, have been infused; the chlorides, camphor, quinine, &c. As it has been satisfactorily shown that great excitement and acceleration of the circulation, besides exhausting nervous and vital power, have also the effect of changing, and even of corrupting, the state of the blood, such excitement should be prevented, and allayed when present, by appropriate evacuations, and by refrigerant saline medicines and beverages.

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BLUE DISEASE.

Syn. *Cyanosis*, (κύανος, blue, and νόσος, disease,) Beaumes. *Morbus Cæruleus*, *Cyanopathia*, Marc. *Exangia Cyania*, Good. *Cyanose*, Fr. *Die Blausucht*, Ger. *Blue Skin*, *Blue Jaundice*.

Classif. 3. *Class*, Sanguineous Function; 4. *Order*, Cachexies (*Good*). IV. Class, II. Order (*Author*, see *Preface*).

1. Defin. *A blue, violet, or purple colour of the integuments, particularly of parts usually presenting a rose or flesh tint, as the cheeks, lips, mucous surfaces, &c.*

2. A blue or purple colour of the integuments of parts, or nearly the whole of the body, may occur as a symptom in the last stage of various acute diseases. But it is present from the beginning of this affection, is frequently connected with comparatively little disturbance until some sudden change takes place, and generally results from chronic organic lesion. In other maladies this colour is an accidental, occasional, and not the most important symptom; in this affection it appears as the only, or the most remarkable, change observed during life.

3. Its Pathology. — According to M. Gintrac, who has directed much attention to this affection, it always proceeds from organic change of the heart or large vessels; the admixture of venous with arterial blood, and the distribution of it to the surfaces of the body, being the immediate or essential cause of the alteration of colour. This pathology agrees with the opinion of Senac and Morgagni: it has, however, been disputed. M. Corvisart first threw out doubts of the constant origin of *cyanosis* in this source; and more recently MM. Ferrus, Breschet, Marc, Louis, Fouquier, and Crampton, have adduced facts which seem to militate against it, while it has received the able support of M. Bouillaud.

4. M. Ferrus contends, 1st, That cyanosis sometimes has existed to an intense degree, and yet upon *post mortem* examination no lesion could be detected admitting of the admixture of venous blood; nor any organic change of the heart or respiratory organs: 2d, That the opening of Botal may continue unclosed for many years without blueness of the surface being occasioned: and, 3d, That the admixture and circulation of venous with arterial blood have been demonstrated to occur in some cases, without giving rise to this peculiar appearance. That the second and third objections are well founded seems almost incontrovertible. Numerous instances have been recorded by Louis, and others, which fully prove these facts. I have met with cases in children, where the communication between both sides of the heart seemed very free, and yet no alteration of the natural colour existed; and others, in which the change was evident during the paroxysms of suffocation only. But I must agree with Corvisart, Richerand, Cloquet, Gintrac, and Bouillaud, that the existence of this opening is no certain proof of admixture of the venous and arterial blood; for if the contractile powers of both ventricles are nearly equal, in relation to the resistance to be overcome, and if the natural openings of the cavities be not obstructed, no admixture of the blood in both sides of the heart could take place.

5. The principal force of the objections, therefore, urged by M. Ferrus, evidently rests upon the fact of the non-existence of organic disease of the heart, large vessels, or lungs, in some cases of the disease, — a fact which is still not satisfactorily established. I believe that it may be safely concluded, that the blue disease of infants

and children is very generally dependent upon a communication between the opposite sides of the heart, or some malformation of the heart or large arteries, particularly contraction of the origin of the pulmonary artery, or some other change affecting the circulation through the right cavities of the organ; whilst in older and aged persons, a similar colour of the surface may proceed from whatever obstructs the circulation through the large veins, lungs, or heart, and even from simple congestion of the venous capillaries from loss of vital power; and in these latter cases, the affection more nearly approaches the blueness observed to occur as a dangerous symptom of various acute diseases of the lungs and heart, as of asphyxy, and of pestilential cholera.

6. *Symptoms, progress, and terminations of blue disease.* — The bluish tint of the external surfaces, whence this malady derives its name, is not equally deep in every part. It is usually deepest over the whole of the face, and the lips in particular, on the hands, feet, and genitals. During any effort, or when crying, this symptom is much more marked than during repose: at the same time the parts presenting a bluish colour, or a violet of the darkest shade, are more or less puffed. The circulating and respiratory functions are rarely without derangement. The disordered circulation is characterised by palpitations more or less violent; sometimes accompanied by a very distinct bellows sound, and by a purring tremor, tendency to faintings, and serous effusions. The breathing is laboured and panting after the slightest effort. The warmth of the body is considerably diminished and patients are very sensible of cold. The functions in general, and principally those of locomotion, are more or less languid, and, as it were, benumbed.

7. The symptoms just described do not always exist in the same degree, during the continuation of the malady. It may even be said that the disorder is made up of a succession of paroxysms and remissions. In the paroxysms alone we observe those frequent faintings, that tumultuous palpitation of the heart, and suffocations, which endanger the life of the patient. No rule can be relied on as to the recurrence of these paroxysms; in fact, if it be certain that they are often brought on by over-exertion, fatigue, and violent mental agitation, it is equally certain that they occur without any assignable cause, and are more frequent in winter than in summer. The length of the paroxysm varies: it sometimes lasts several hours, and generally abates gradually. The *termination* of cyanosis is fatal to most patients; but some appear to recover entirely; others live for many years. Cases of this kind have been recorded by MORGAGNI, SANDIFORT, and RICHERAND. The death caused by this disorder is sometimes very sudden; but in the majority of cases it is preceded by an intense suffering, characterised by the most acute anguish, difficulty of breathing, fainting fits, and cold sweats. In a case of remarkable blueness from birth, in a girl, who was for some time under my care, the colour changed, in the course of two or three years, to dirty yellowish, chlorotic tint, which is still retained up to the thirteenth year. The disorder of the heart's action and respiration, in this case, although more or less considerable, was never very severe; but the child was always remarkably delicate, and incapable of any bodily or mental exercise.

8. *Lesions observed after death: and their connection with the symptoms.* — 1st, The most common lesion is the persistence or the re-establishment of the opening of Botal. This communication of the two auricles is generally accompanied by an obstacle to the passage of the blood from the right auricle into the corresponding ventricle, or from the latter into the pulmonary artery. Twenty-seven cases out of fifty three reported by M. GINTRAC, presented such an obstacle. In twenty-six of these cases the circulation on the right side of the heart was impeded either by a contraction or by a total obliteration of the orifice of the pulmonary artery, and in only one case by the contraction of the right auriculo-ventricular orifice. Co-existent with these lesions is usually a hypertrophy of the right ventricle and auricle, or of one only of these cavities, with or without dilatation. Sometimes the ventricular cavity is itself contracted. 2dly, The ventricular partition has often presented a solution of continuity of more or less extent. 3dly, The arterial canal remained open in some subjects. 4thly, In one of the cases reported by M. GINTRAC the two auricles (imperfectly divided) opened into the right ventricle: the latter being very large, communicated freely with the left, which (narrow and without auricular orifice) gave origin to the aorta. 5thly, In another case, the aorta and pulmonary artery sprung from the left ventricle, the right being almost obliterated, and the inter-auricular partition perforated. 6thly, In another instance, the opening of Botal was preserved; the aorta disappeared after having supplied the cephalic and brachial trunks; the pulmonary artery, receiving the blood from both ventricles, formed the descending aorta. 7thly, Such a transposition of the larger arterial trunks has been witnessed, as the aorta springing from the right ventricle, and the pulmonary artery from the left; the opening of Botal and the arterial canal still remaining, or only the latter. 8thly, In some cases the heart consisted only of one auricle and one ventricle. 9thly, Two superior venæ cavæ were seen, the one opening into the left auricle. It is unnecessary here to enlarge upon the other lesions noticed in persons afflicted with this complaint, because they do not necessarily belong to the subject.

9. As respects the *relation between the symptoms and lesions*, M. BOUILLAUD remarks, that the alterations pointed out in the central organs of circulation have usually the effect of permitting the black blood to mingle with the red; but some of these lesions, as previously observed, such as the opening of Botal does not necessarily entail this admixture; for which reason it is not invariably accompanied by blueness of the teguments; either the black blood not having mingled with the red, or the mixture being insufficient to produce the bluish colour. But when the arterial canal remains open; when the aorta springs from both ventricles jointly; or when, to the communication between the right and left cavities, is superadded an obstacle to the free current of blood in the former; a considerable quantity of black blood must necessarily mix with the red. Whenever an anormal communication between the cavities of the right and left divisions of the

heart co-exists with an obstacle to the circulation of the blood in the right ventricle or in the pulmonary artery, the mixture of the blood is not the sole cause of the discoloration of the skin, the puffing of certain parts, of various serous congestions, &c. In fact, it is evident, that the impeded circulation contributes mainly to the production of these phenomena. Should we not also attribute to the contraction of the auriculo-ventricular, or ventriculo-pulmonary orifices, the bellows sound and the purring tremor remarked in some patients? However this may be, some of the lesions coincident with blueness of the teguments are invariably congenital; while others (such as the communication between the right and left regions of the heart) may be either congenital or accidental.

10. The *causes* which develope most of the congenital lesions, from which blueness may ensue, are not easily determined on. But a communication between the right and left cavities of the heart may be occasioned by ulceration of the auricular and ventricular partitions, or by the rupture of these partitions, especially of the auricular, in violent and lengthened efforts. An obstacle to the course of the blood through the right auriculo-ventricular, or the ventriculo-pulmonary orifice, may also, particularly in the early stages of life, induce an anormal communication between the two auricles, by ungluing, as it were, the valvular laminæ, which, by their agglutination, have obliterated the opening of Botal. The existence of a similar obstacle at an intra-uterine period of life, when the opening still remains, may be also deemed a sufficing cause for its ultimate non-obliteration. (*Dict. de Méd. et Chirurg. Prat.* t. vi. p. 7.)

11. I am of opinion, not only that such obstacles have very generally existed during intra-uterine life, and been the cause of the blueness observed afterwards, but that they have also occasioned, during fœtal existence, a permanent state of distension; and thence, in some respects, malformation of the capillary system, particularly in the cutaneous and mucous surfaces, favouring congestion, and languid circulation through them after birth, and the consequent blueness, and the puffiness that generally attends it. I may add, as a matter of diagnosis, that very intense and general blueness is not uncommonly produced by the incautious internal use of the nitrate of silver. I have observed two or three such cases, and others are recorded by Albers, Roget, &c. (*Med. Chir. Trans.* vol. vii. p. 284.)

12. Treatment.—Art is of little avail in this malady. We must chiefly depend upon the efforts of nature in bringing gradually about a change in the lesions on which it depends; and attempt to assist her efforts, by directing bodily and mental repose, and a pure, mild, dry, equable and somewhat warm air; by attending strictly to the state of the biliary and other secretions, and the digestive functions; and by recommending gently tonic medicines, with an easily digested and nutritious diet. During the paroxysms, M. Bouillaud recommends blood-letting,—a practice which is by no means warranted by my experience. Depletions, and all other lowering means, aggravate the symptoms, and seldom or ever succeed in removing the severity of the paroxysms, for which he advises them. I have derived more advantage from stimulating pediluvia, frictions of the surface of the body and lower extremities, and the administration of gentle antispasmodics and stimulants. (See F. 348. 424. 663.) In one or two instances, I conceived that some advantage was derived from the preparations of iron combined with the fixed alkaline carbonates. (See also F. 94. 662. 718. 920.)

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BRAIN—its Morbid Structures.

Syn. Ἐγκέφαλος, Gr. *Cerebrum*, *Encephalon*, Lat. *Cerveau*, *Encéphale*, Fr. *Das Hirn*, *Gehirn*, Ger. *Cerebro*, Ital.

Classif. Special Pathology and Morbid Structures. IV. Class, III. Order (*Author*, see *Preface*).

1. With the view of avoiding unnecessary repetition, and of furnishing a complete account of the changes and morbid phenomena connected with the parts contained within the cranium, alterations of structure will be considered in the first place, and in systematic connection; and, afterwards, inflammations affecting either the brain or its membranes, will receive attention. As similar lesions develope themselves in the brain, or its membranes, in the course of a variety of diseases; and as many of those which are most commonly found upon dissection give rise to very different phenomena during life; their arrangement in a separate form will facilitate reference to them, when those specific states of disease, which they either originate in, or occasion, are being discussed. Thus tumours formed in the brain, or purulent matter secreted there, or induration or softening of the cerebral substance, &c. are not infrequently found in cases of either palsy, epilepsy, insanity, or encephalitis, without limitation to any one of them. Instead, however, of describing these and various other lesions, when considering each of these diseases, I shall here give a minute description of the morbid structures observed in the brain and its membranes, and refer merely, when discussing these and other diseases implicating the cerebral functions, to those changes most commonly found on dissection of fatal cases, as they are described in this article.

2. Of all the organs of the body, the brain is the most exquisitely and incomprehensively formed, and presents the least intimacy of connection between the results of dissection and the phenomena of disease. The most violent symptoms referrible to this organ often exist during life; and yet, on the most careful examination, after death, either no appreciable lesion, or none sufficient to account for the phenomena, can be detected. Whilst, on the other hand, many, and most important changes are frequently discovered in both the brain and its membranes, in cases which betrayed either no cerebral disorder, or none calculated to excite suspicion during life of any organic change. It is extremely important to be aware, not only of this fact, but of the circumstance just alluded to, that the same morbid appearances, or, at least, states so nearly alike

that they cannot be distinguished, will frequently be found after maladies very dissimilar as regards their cause, nature, and consequences. Thus, irritation of the brain occurring in the progress of fevers, and the exanthemata; convulsions, insanity, drunkenness, puerperal derangements, metastasis of gout, and various other diseases, will be attended with congestions, injection of the blood-vessels, secretions of lymph, or serum, or of air between the membranes, &c.—states in every respect similar to those proceeding from idiopathic inflammation. Nor should it be forgotten, that the kind of death, the particular circumstances attending it, and the position and changes to which the body is subjected immediately afterwards, tend very materially to influence the appearance and states of the parts within the cranium. In the view which I am about to take of the principal lesions of structure affecting the encephalon, I shall *first* notice the morbid states of its membranes; *next*, the lesions presented by its sinuses and other blood-vessels; and, *lastly*, the diseased appearances of the different parts of the encephalon itself.

3. I. Morbid States of the Membranes of the Brain.—The intimate connection which the membranes of the brain have with the cranial bones on the one side, and the brain itself on the other, and their expansion between both, render them extremely liable to participate in all the malformations, diseases, and external injuries of those parts. Whilst they most commonly, with the limpid fluid exuded between them, separate those parts, and facilitate the motions of the latter, they also often prevent the extension of morbid action from the one to the other. But they do not always succeed in thus limiting disease; for they frequently become secondarily affected during maladies commencing either in the skull or the brain; and, when thus involved, they, in some measure, become the medium of mutual infection. But the membranes are not only thus secondarily affected; they are also not infrequently themselves the primary seat of disease; and when such is the case, the parts on each side of them, particularly the brain, seldom fail of participating more or less in the disturbance. Thus we often find them the primary seat of congestion, inflammation, with its consequences, as effusion between them of various kinds of fluids; and the source whence disease has extended to the brain itself. Those changes are presented to our view, not only in the primary inflammations of the membranes, but also in several forms of fever; in morbid affections of the mind, tetanus, delirium tremens, convulsions, epilepsy, apoplexy, palsy, and other diseases, wherein we have reason to suppose that the brain itself is either primarily and principally affected, or participates largely in the morbid states of its envelopes.

4. i. The Dura Mater is often found *unusually adherent* to the cranium, even when the brain and its membranes have been quite free from change, but more commonly when chronic disease has existed in either the one or the other. It is also sometimes *slightly adherent* to the skull, and occasionally this want of adhesion is very remarkable. In some instances, the dura mater is *separated entirely* from a portion of the cranial bones. In some rare instances, the space is filled with a *watery fluid;* but this has only been met with in hydropic children. The separation is generally the result of external injuries; and either *blood or pus*, or even both, is usually found in the space between the bone and the membrane. In some cases, these effused fluids, particularly blood, either fluid or in coagula, are in considerable quantity, occasioning the usual symptoms depending upon pressure. *Lymph*, in various degrees of firmness, is also found between a part of the dura mater and the skull; and this, as well as *pus*, with which the lymph may be partially mixed, are generally the result of inflammations consequent upon external injuries. These appearances have been sometimes observed in fatal cases of epilepsy, but only when the patient has received some injury during the paroxysm. They are often connected with a puffy swelling of a corresponding portion of the scalp.

5. The *dura mater* itself may be here viewed as two membranes, closely united throughout by means of fine, close, cellular tissue: the exterior, or that applied to the cranial bones, resembling in structure, and performing the office of, periosteum; the interior, or unattached, being a reflection of the arachnoid, and having, as respects its functions, a more intimate relation to the included organs: the former being a fibrous; the latter, a serous membrane.

6. *A*. The *fibrous structure of the dura mater* is frequently more than usually *vascular*, particularly in fatal cases of apoplexy, paralysis, fever with cerebral symptoms, epilepsy, and in the congestions which occur in the last stages of whooping-cough, pulmonary diseases, asphyxia, and poisoning by narcotics. This state is, however, very different from inflammation, as the minute capillaries do not present the same degree of redness, particularly in the unattached or arachnoid surface. This structure is sometimes *tinged* with bile, and of a deep yellow colour through its whole extent, as in cases of acute jaundice, which are attended with comatose symptoms. After contusions, or when suppurations exist beneath or exterior to it, it is either yellow, dusky, bluish, brownish, or even blackish. It is also occasionally spotted with black, in some cases of melanosis. In some instances, this membrane seems *distended* from fluids effused in the cavities of the brain, or between the membranes: in others it is apparently *corrugated* or *collapsed*. This latter state generally proceeds from it having been punctured during the separation of the calvarium, the fluid which it had contained having thereby escaped. But it is sometimes noticed where no such accident occurs, particularly in extremely emaciated bodies, or in the very aged, when little or no water is collected beneath it. A more than *usual dryness* and *transparency* is occasionally observed in this as well as in similar structures. Unusual dryness is also sometimes conjoined with a *shrivelled* state, and *deficient transparency*. Otto thinks that this is one of the remote effects of inflammation.

7. It is but rarely *inflamed*, excepting from external injuries, and then generally in circumscribed patches of greater or less size. In these cases, the *injection* and *redness* are very remarkable, particularly in the vicinity of purulent formations and injuries of the bones, or where ulceration, discoloration, fractures, abscesses, &c. exist in its vicinity. *Suppurations*, in which the pus is

found between its layers, or on its outer surface, are very rare. Cases, however, are referred to by OTTO of this occurrence. When suppuration does occur, it is generally seated in its inner surface. In some of these cases, the purulent matter has eroded, and perforated the skull and layers of the dura mater exterior to it. *Thickening* of the dura mater is not an unusual result of chronic states of inflammation. It varies extremely in degree, and it is sometimes so great as to occasion symptoms of pressure and irritation. It is sometimes found in fatal cases of epilepsy and paralysis; and is occasionally conjoined to *induration* of the thickened part. *Ossification* of the fibrous structure of the dura mater is a comparatively rare occurrence, whilst ossific deposits in its free or arachnoid surface are very common. In the former case, the bony matter follows the fibrous arrangement of the membrane, and involves its substance. Two interesting specimens of this change are referred to by Dr. BRIGHT (*Reports of Medical Cases, &c.* vol. ii. p. 663.). Ossific deposits may likewise be ascribed to slight, or chronic states of inflammatory action.

8. *Tumours* also form in the dura mater. Those which are most intimately connected with it have a *fibrous* structure; whilst the *fungoid* tumours sometimes observed seem to be common to both this membrane and the arachnoid lining it. Nor are they limited to the dura mater, as supposed by LOUIS and the WENZELS; but they may arise also in the bones of the skull, as shown by WALTHER, GRAAFF, and SIEBOLD; and even in the pericranium, as contended for by OTTO, EBERMAIER, and CRUVEILHIER. *Osteosarcoma*, or *fungus cranii*, therefore, as stated by VON WALTHER, and *fungus duræ matris*, are merely different, although often simultaneously occurring forms of the same disease. (See § 17.) When fungous tumours originate in the dura mater, they not infrequently perforate the skull, by occasioning absorption of the superincumbent portion of bone: but they also often involve the bone in a similar change, giving rise to fungus cranii as now stated. They occur in every part of the dura mater, commencing more frequently in its inner coat, and are found oftener in this situation, than in the bone itself, or the pericranium. (See CRANIUM.)

9. *Other kinds* of tumour are occasionally found in the dura mater. But those of a constitutional origin usually commence either in the arachnoid covering the dura mater, or in the fine connecting cellular tissue. They, however, generally soon involve, not only this latter membrane, but also occasionally the cranial bones. Of these tumours, comprising the *scrofulous*, *scirrhous*, *carcinomatous*, and the *hæmatoid*, I shall make more particular mention in the sequel. Although sometimes found in the inner surface of the dura mater, they are met with only consecutively upon their original manifestation in some other part of the body. More rare than any of the foregoing, is the occurrence of *fatty* and *encysted tumours* on the exterior surface, or between the layers of the dura mater. They have been found in this situation by MORGAGNI, FRICKE, and OTTO; and, in very rare instances, have been observed to contain hair. *Scrofulous* tumours are less frequently found exteriorly to, and between the layers of, the dura mater, than in its internal surface.

10. *Unusual thinness* has been observed in some parts of this membrane; and some of its processes have been wanting, owing to their *absorption*; in some cases, without any obvious cause, but more frequently from the pressure of a tumour of the brain, or some other morbid enlargement. "The falciform process, and a part of the sensorium, have been wholly removed, and large portions of the dura mater and its processes have been found as thin as silver paper." (HOOPER, *Morbid Anatomy of the Brain, &c.* p. 29.) When portions of the *dura mater* are destroyed by any internal cause, or even by external injury affecting the bone, they are rarely or never *reproduced*, and never otherwise than by a thick or *dense cellular tissue* closely connected with the newly formed bone; or, if the bone be not produced, after having been destroyed, it assumes a fibro-cartilaginous state, and becomes consolidated into a common cicatrix with the integuments. *Rupture*, or *laceration* of the dura mater is generally the consequence of fractures of the cranium and concussion. It has, however, proceeded from violent coughing, after the superincumbent bone has been removed by fracture, or by trepanning, &c.

11. *B. Morbid states of the arachnoid covering the dura mater.* — The internal surface of the dura mater is lined by a reflected portion of the arachnoid membrane, the unattached surface of the dura mater thus consisting of a true serous membrane, intimately attached to, although different in its nature from, the fibrous structure which it covers. *Inflammation*, whether originating in the dura mater itself, or in this surface, chiefly manifests its distinctive characters and effects on this lining: and generally presents, especially in the early stages of the acute disease, a minutely injected state of the capillaries, with a bright red tinge of the whole surface. This appearance has been beautifully illustrated in the first of Dr. HOOPER's plates of lesions of the brain. When acute inflammation attacks this part, it is generally confined to one side, the longitudinal sinus or the falx furnishing the boundary of the disease. In very acute attacks, and in the advanced stages of inflammation of the dura mater, the internal surface becomes covered by a layer of *fibrinous lymph*, into which, as I have shown in respect of serous membranes generally, minute vessels may be traced, when the exudation of this substance has been proceeding for some days. It is usually diaphanous, very delicate, and forming a complete adventitious membrane. In other cases, a much thicker, opaque, and albuminous-like membrane, of much firmness, less vascular and less intimately adherent to the dura mater, is formed. Although the fibrine and albuminous matter exuded may be both abundant, and thus provided with vessels, it is seldom the medium of adhesion; or, indeed, at all adherent, to the arachnoid covering the convolutions: and if adhesions have formed, they are very slight in respect of this latter duplicature of the arachnoid, unless very acute inflammation also exists in the pia mater, directly opposite to the inflamed surface of the dura mater.

12. In more chronic forms of inflammation, this surface not infrequently assumes a *spongy appearance*, with more or less redness and marked injection of the vessels. In some cases it has a *villous aspect*, from a slight exudation of albuminous matter, and interstitial effusion of serum

in the texture of the arachnoid lining. *Purulent matter* is seldom formed to any considerable extent; but, when it is secreted, it usually spreads thinly over the membrane. It seems generally to proceed from the inflamed surface, without any distinct appearance of ulceration. In some cases, however, owing to adhesions of the membranes around it, circumscribed accumulations of pus are met with; and these may cause the erosion of the dura mater and bones exterior to them. Although the productions now noticed sometimes are observed to follow idiopathic inflammations of this part, they are more frequently the results of external injuries; and are more commonly met with in the parts which cover the hemispheres, than in the basis of the skull, unless there be a very general state of inflammation of the parts within the cranium.

13. *Adhesions* of the lining membrane of the dura mater to the arachnoid and pia mater are chiefly observed when both reflections of the arachnoid are inflamed, particularly in chronic affections of the cranial contents. The medium of adhesion varies considerably. It is frequently found to consist of a firm but thin exudation of fibrinous lymph or of albuminous matter: in some cases, delicate, diaphanous, and vascular; in others, thick, opaque, and less intimately adherent to the internal surface of the dura mater than the preceding. In a few instances, it is formed of fine filamentous bands passing through a more than usually copious effusion of serum; and occasionally the membranes are intimately and firmly joined, even without any very apparent medium of union, particularly at the centre of the part adherent. This is chiefly seen immediately over or near the situation of severe organic disease of the brain itself, as abscess, tumours, superficial ulcerations, &c. In some cases, the adhesions are so firm that, in attempting the raise the dura mater, the subjacent membranes, with a portion of the brain, are removed along with it.

14. *Ecchymosis* and *purple spots* arising from the effusion of blood, in minute patches, beneath its arachnoid lining, are sometimes observed in the unattached surface of the dura mater, and partake of the character of purpura. They are most commonly found in cases of cerebral disease, which has been complicated with chronic change of the biliary organs and deficient energies of life, — or with general cachexia. *Carbonaceous deposits*, or *melanosis*, have also been sometimes observed in the situation. Dr. BRIGHT believes them to be the result of extravasated blood. (See the art. MELANOSIS.) *Ossific deposits*, generally disposed in plates, or much thicker in the centre than the circumference, and varying much in number and situation, are also frequently found towards the surface of the dura mater. They seem covered by the arachnoid, are closely adherent to the dura mater, and formed between them. They occasionally present an irregular surface, or assume a nearly conical form, and are often connected with nervous diseases, particularly epilepsy. They are most frequently met with upon the falx, and near the part where the dura mater separates to form the longitudinal sinus.

15. *Tumours* not infrequently proceed from the internal surface of the dura mater. Many of those productions are actually formed in the arachnoid lining this surface; being only adherent, and often very slightly, to the proper structure of the dura mater, and in no way changing its characters. As these tumours increase in bulk, they gradually produce debility of both mind and body, particularly the former. Much of the severity and rapidity of these effects will, however, depend upon the rapidity of their formation. When small, and sources rather of irritation than compression, convulsive affections are oftener occasioned by them than paralysis: when large, they more frequently give rise to paralysis than convulsions: but either of them may be followed by any of those affections; mental weakness being the more constant, and often the most remarkable effect. Many, also, of the tumours developed in the dura mater can scarcely be said to originate either in its fibrous membrane, or in its serous or arachnoidal lining: but should rather be referred, at their commencement, to the cellular tissue uniting those layers. Amongst those which seem more frequently at least to originate in this latter situation, — although often involving, and in a very short time, all the layers of the dura mater, and even the parts adjoining, — the scrofulous, the cartilaginous, the hæmatoid, and the encephaloid or fungous tumours, require the most particular notice. The *scrofulous tumour* is found on the internal surface of the dura mater, having an organised, fleshy, solid, and humid appearance; and is but rarely met with, and only in connection with scrofulous disease in some other part of the body.

16. The *cartilaginous tumour* is generally seated in close connection with the dura mater, and under its arachnoid lining. It varies as much in the perfection of the cartilaginous state, as in its size. It is sometimes perfectly cartilaginous; at other times merely gristly. It is oftenest met with in the falciform process and tensorium; and is occasionally attended with ossific deposits in the same situations. Indeed, as remarked by Dr. HOOPER and Dr. MONRO, some of those tumours are partly ossified, so that the cartilaginous state seems to be often an intermediate stage between that of gristly firmness and complete ossification. A case is described, by Mr. WATSON, in Dr. MONRO's work, of a cartilaginous tumour, the size of a walnut, containing bony matter towards its centre, growing from the dura mater. The *sub-cartilaginous tumours* are often tuberculous, of a dirty white colour, always distinct, but often numerous, and varying from the size of a pea to that of a hazel-nut. They generally are found between the dura mater and its arachnoid lining, have a broad base, present a clean smooth surface when divided, are firm, and devoid of vascularity. They seldom affect much the superincumbent dura mater and bone, but deeply indent the substance of the brain.

17. The *malignant tumours*, which are occasionally met with in the dura mater, assume the *sarcomatous*, the *carcinomatous*, and the *fungoid* characters. The fungoid disease may be either *encephaloid*, or *hæmatoid*. The *encephaloid tumour* is not common. Its divided surface is cellular and spongy, and gives out a pap-like matter when pressed. Its structure is more generally approaching to the fungoid, than to the tuberculous. It seems to be entirely produced from the lining membrane of the dura mater, and is almost always connected with scirrhous or malignant

diseases originating in some other part of the body. The *hæmatoid tumour* is of the colour of venous blood, has a broad base, and a fungous, sometimes a tuberculous, structure. It is soft to the touch, is covered by a delicately lamellated tissue, thinner than silver paper. When divided, it appears spongy, and extremely vascular. It is very rare, and is always connected with the primary occurrence of the disease in some other part of the body. The *simple cyst*, or *watery tumour*, the *hygroma* of Dr. HOOPER, is seldom or ever observed in this situation, although frequently in other parts of the encephalon. A case of it, however, occurred to Dr. DUNCAN. The *acephalocyst*, or headless hydatid, has been found connected with the arachnoid of the dura mater, in a very few cases.

18. The CAUSES of malignant, or constitutional tumours in the dura mater, are generally external wounds or contusions, concussions, the scrofulous or syphilitic taint, and most commonly previously existing disease of a similar nature in other parts of the body.

19. The SYMPTOMS by which their existence may be inferred are extremely equivocal. At the early periods of their growth, they frequently give rise to little or no disturbance. Much, however, will depend upon the rapidity with which they are formed, and their situation. When they grow slowly, the portion of brain becomes gradually accustomed to, and, as it were, insensible of, the pressure; it seems to waste; and, if this compressed and atrophied part be not indispensable to the free exercise of the sensorial, intellectual, and locomotive functions, the disease produces no evident or sensible indication of its existence. But sooner or later the compression produced by them on the brain, or the irritation occasioned in the membrane, gives rise to symptoms of the most serious nature; frequently in a very sudden manner, sometimes more gradually. These chiefly consist of paralysis, epileptic convulsions, and apoplexy, occasionally occurring as suddenly as in the sanguineous forms of these diseases. Most commonly, however, and especially when the tumour is situated in or near the base of the brain, the symptoms, whether those of compression or of mental disorder, supervene more rapidly: sensation and volition gradually disappear from the limbs which correspond with the compressed portions of brain; the intellectual powers are obscured, and the patient soon becomes hemiplegic and idiotic. The gradual accession of hemiplegia, and of the other symptoms of compression, generally indicate that the paralysis arises from the developement of a tumour, rather than from the formation of an apoplectic effusion of blood. The frequent occurrence, also, of acute pain in the paralysed limbs, of epileptic movements, antecedent cephalalgia of a violent character, with obscuration of the intellectual powers, somnolency, a cachectic habit of body, or the occurrence of disease in other parts of the body calculated to taint the system, as the scrofulous, syphilitic, carcinomatous, or fungoid diseases, are also circumstances indicating the formation of tumours in the membranes of the brain.

20. These tumours usually give rise to further disease of the brain, or its membranes, before terminating life; such as inflammation of the parts adjoining, effusions of fluid beneath or between the membranes, adhesions of their opposite surfaces, destruction of the bones, softening and pulpy destruction, &c. of the cerebral substance; sanguineous effusion in this situation: and these increase the severity of the symptoms, and hasten the fatal termination. It should, however, be kept in recollection, that the effects produced by these tumours have in general no relation to their bulk. One of the circumference of one or two inches will often occasion (the situation and nature of the tumour being the same) as violent effects as another of four or five inches. It is, moreover, not to the tumour itself that the symptoms are to be imputed, but to the effects it produces on the brain and membranes.

21. ii. MORBID CHANGES OF THE ARACHNOID AND PIA MATER. — *A.* The ARACHNOID is so delicate, perfectly transparent, and so intimately adherent to the pia mater, except at the base of the brain, as to admit with difficulty of separation from it. That lesions, therefore, of the latter membrane should affect also the former, cannot be a matter of surprise. Indeed, the greater number of changes which I shall to have to notice in this section generally invade both these membranes simultaneously, although either of them may be affected in a more or less marked degree.

22. *Inflammatory action* gives rise, though very rarely, about the optic nerves and between the lobes of the cerebellum, to small patches of beautiful *vascularity* in the *arachnoid*; the surrounding portions of this membrane being opaque, and adhering to *inflamed* parts of the pia mater. It is, however, very uncommon to find, even in the most intense inflammation of these membranes, red vessels in the arachnoid. The most frequent results of inflammation in this situation are, *thickening*, and the effusion of a watery or *serous fluid* under it, raising and separating it, in places, from the pia mater, particularly in the intergyral spaces. The *fluid* secreted in this situation is generally transparent, but it is sometimes turbid and albuminous, occasionally opaque, and tinged with bile in jaundice. In rarer cases it is tinged with blood. *Thickening* and *opacity* of the arachnoid vary much in degree. They are occasionally so great as to obscure the vessels and membrane underneath it. Less frequent than the foregoing is the secretion of a *puriform matter*, under the opaque and thickened membrane, giving the appearance of a diffused suppuration; and still more rare is the deposit of *fibrinous lymph*, unless in a state nearly approaching to an albuminous substance, or a puriform fluid.

23. The effusion of a *serous fluid*, in excessive quantity, exterior to the arachnoid of the pia mater, and in the bag of the arachnoid coat, around the encephalon, forming *dropsy of the cerebral membranes*, is sometimes observed. It has been fully demonstrated by M. MAJENDIE, and confirmed by other enquirers, that this membrane secretes a fluid, in health, varying somewhat in quantity with the state of the brain, and of its circulation; that this fluid cannot be materially diminished, or entirely deficient, without morbid phenomena being produced; and that it may, in disease, not only be secreted in too large quantity, but also in modified quality. In some cases of chronic and congenital hydrocephalus,

particularly when accompanied with *spina bifida*, the effusion is chiefly in this situation. In those, it is usually pellucid, and the arachnoid is not materially changed in its appearance. In more rare cases, however, this fluid has been observed somewhat turbid, as well as excessive in quantity; and the arachnoid opaque and thickened. In these, it would seem to have proceeded from increased vascular action affecting this membrane and the pia mater. Effusion of a watery fluid, however, in this situation, is much less frequent than in the ventricles. It is commonly congenital and chronic in these latter cases; and it sometimes protrudes the membranes, in large watery tumours, through apertures in, or between, the bones of the head. Several cases of this kind have occurred to me in the Infirmary for Children. In dropsy of the ventricles, which is most common, producing almost all the large watery heads, the fluid is collected in the bags of the arachnoid and vascular membranes lining the cavities of the brain, so that it is contained, either in all, or the greater number of them, at the same time, which is most frequently the case; or in one of them only. Serum effused from the arachnoid and vascular membrane (pia mater) may thus be situated:—1st, In the sub-arachnoid cellular tissue; that is, between the arachnoid of the pia mater and this vascular membrane: 2d, In the great cavity of the arachnoid around the encephalon: 3d, In the different ventricles, and even in the cavity between the two folds of the septum lucidum (Breschet). The quantity of serum effused in these situations varies remarkably. In *congenital and chronic cases*, it is sometimes uncommonly great, filling up and distending enormously the cranial cavity; impeding or arresting the developement, altering the form, and even injuring or destroying the texture, of the cerebral substance, which is expanded in the form of a sac; that part of it above the ventricles sometimes consisting of the meninges merely. In *acute hydrocephalus*, the effusion takes place in a few days, and to a much less extent; and in *serous apoplexy* it may occur in a few hours. In these latter diseases, however, it is often a matter of dispute, whether the symptoms are more the result of the effusion, or of diminished vital endowment, and the state of circulation of the brain. (See Dropsy *of the Encephalon*.)

24. *Dryness of the arachnoid* is occasionally found after cases of excessive cerebral irritation, and where inflammatory action has been suspected. There can be no reason wherefore deficient secretion should not sometimes occur here, as well as in other serous membranes, as a result of inflammation. An *unctuous* state of the arachnoid is sometimes observed, particularly after erysipelas, abscess of the brain, discharges from the ear, paralysis, &c., and other states of disease, in which there was reason to infer the existence of inflammatory irritation of the membranes of the brain. *Adhesions* of the arachnoid to the opposite surface of the dura mater, by means of a cellular or firm albuminous false membrane, &c. have been already described (§ 13.). *Dark carbonaceous* deposits, similar to those noticed (§ 14.) in the internal lining of the dura mater, are also rarely observed in the arachnoid and pia mater. *Osseous deposits* also occur in the arachnoid, and are likewise rare.

25. *B.* The Pia Mater partakes in all the inflammatory states, and their consequences now described in respect of the arachnoid. The *vascularity* of this membrane varies greatly. Sometimes it consists chiefly of engorgement of its veins, imparting to it a dusky or purplish hue, without any sign of inflammatory or other change. Occasionally this congestion is attended with injection of the arteries, and increased redness only, or with these in conjunction with one or more of the lesions now referred more immediately to the arachnoid.

26. Slight *effusions of blood*, and patches of *ecchymoses*, varying from the size of a split pea to that of a half-crown, are occasionally found lying upon the surface of the convolutions, and retained between the meshes of the pia mater. This state arises from concussions of the brain, and congestions consequent upon suffocation, poisoning by narcotics, and the advanced stages of disease; also from obstructions in the vessels returning the blood from the brain. A layer of *fibrine* is sometimes, but rarely, observed as a consequence of effusions of blood between the pia mater and brain; the serum and red particles of the effused blood having been absorbed, and its fibrine remaining.

27. The *pia mater* and *arachnoid* are occasionally separated from the convolutions in consequence of concussion; and in some cases, particularly after acute or recent inflammations, they may be removed from the cerebral substance with scarcely any force, or with much less than in health, the vessels being loaded with blood. Otto thinks that the *easy separation* of the vascular membrane from the brain originates in the effusion of lymph beneath the membrane, loosening its connection to the cortical substance. On the other hand, after chronic inflammation, occurring without effusion under the membranes, but with a considerable effusion into the ventricles, they are often found so *closely adherent* to the convolutions, that they cannot be separated, but in very small fragments, and then not without bringing away with them portions of the cineritious substance of the brain.

28. Patches of *yellow, albuminous, or albumino-puriform* matter, are sometimes found on the upper surface of the pia mater, between it and the tunica arachnoidea. These patches are usually small; but they are occasionally very large, and diffused over nearly the whole of one hemisphere. Dr. Hooper has observed them covering nearly the whole of the base of the brain, so as to envelope most of the nerves. This appearance seems to result from a more than usually intense state of inflammation, as all the membranes are found inflamed, and the blood-vessels loaded with dark blood, and to differ but slightly from the effusion of *pus* and lymph already described in connection with changes of the arachnoid. *Ulceration* and *mortification* are very rare consequences of inflammation of the pia mater. They may, indeed, be rather considered as superficial ulceration and gangrene of the brain. Cases, however, have been met with, sometimes connected with superficial suppuration, affecting chiefly this membrane. (Buzzi, Morgagni, Dubrevil, Otto.)

29. *Tumours* often grow from the *pia mater*. The *scrofulous kind of tumour* or *tubercles* are not very rare in this situation. When they occur,

they sometimes reach a large size, and break down into a puriform fluid, forming circumscribed or encysted abscesses on the surface of the brain. Leiveillé found them as large as an egg, in an idiot. Cases are also described by Earle, Abercrombie, Otto, and others. Tumours *of a sub-cartilaginous structure* are very rarely met with in the pia mater, although occasionally in the *choroid plexus*. They are usually of the size of a pea, round or oval, laminated, cartilaginous in the centre, exteriorly tuberculous, and covered with a delicate vascular membrane.

30. True *encysted tumours* are also sometimes met with in the pia mater. Otto describes one of immense size,—six inches long by three broad,—found on the right hemisphere of the brain of the Duke of Saxe-Gotha. Esquirol met with a tumour of this kind containing fat; and similar instances have been recorded. *Ossific deposits* and *earthy concretions* have been rarely observed on the internal surface of the pia mater, dipping down into the structure of the brain.

31. *Serous cysts*, the hygroma of Dr. Hooper, consist of a delicate and transparent membrane, filled with a clear, limpid serum. There is in some cases only one, in others two, three, four, or even more. When solitary, they vary from the size of an orange-pip to that of a walnut; but they are seldom much above the bulk of a large pea. When numerous, they are usually much smaller. They are very rare in the membranes of the exterior surfaces of the brain; but they are very common in the *choroid plexus*, where they are frequently in clusters. They have been mistaken for hydatids, but are merely simple cysts, containing a serous fluid. They have likewise been found in the adventitious membranes formed on the surface of the brain. They generally furnish no symptom by which their existence can even be suspected during life. The *acephalocyst*, or headless hydatid, is seldom or never found in the pia mater. Five species of the *Cysticercus*, or the bladder-tailed worm, namely, the *C. tenuicollis*, the *C. Fischerianus*, the *C. dicystus*, *C. punctatus*, and the *C. Finna*, have been discovered respectively by Brera, Fischer, Laennec, Treutler, and Werner, either in the pia mater or *choroid plexus*. (*Art.* Cysticercus, *Dict. de Méd.*)

32. *Fungoid*, *hæmatoid*, and other malignant *tumours*, are sometimes found in the pia mater and arachnoid; but I believe they are seldom or never met with as a primary disease, but associated, as a consecutive change, with fungoid or malignant disease in some other part of the body. When they grow to any considerable size, they become deeply indented into the convolutions; producing at first irritation, and afterwards, as they increase, symptoms of pressure. When, therefore, such phenomena present themselves in persons with fungoid disease, we may suspect its developement also in the brain.

33. *C.* The Choroid Plexus, and the *vascular plexus* of the fourth ventricle, which are all productions of the pia mater, are often found remarkably *distended with blood*, and their *vessels varicose*, particularly when the pia mater has its vessels overcharged. The choroid plexus is also sometimes uncommonly *pale and exsanguine*. This generally occurs when considerable effusion of serum has taken place in the ventricles, especially when the effusion is connected with debility. Sometimes the plexus contains a number of *transparent vesicles* (see § 30.), and it occasionally presents a *granulated* or *fleshy* appearance. This has been ascribed to a morbidly enlarged state of the glandular apparatus, with which, in the opinion of some anatomists, this structure is naturally provided. *Gelatinous tumours* about the size of a bean, and surrounded by a cyst, have also, though rarely, been observed in this situation. Tumours of a *cheesy* or *sub-cartilaginous* consistence, the size of a pea, are likewise found, in some rare cases; and occasionally these tumours contain *ossific deposits* in their centres. *Bony* and *earthy concretions* are still more rarely met with in the choroid plexus than in the membranes. All these morbid changes have been most frequently observed in apoplectic, epileptic, and paralytic cases; but they have also been frequently detected where no particular symptom referrible to the nervous system had manifested itself during life.

34. The *membrane which lines the ventricles* is naturally extremely thin and transparent. No blood-vessels, excepting those which ramify over the corpora striata and thalami from their trunks, which pass by the side of the tænia semicircularis, are usually observed in it. The vessels, however, of this membrane are sometimes found much enlarged, and gorged with blood, particularly when a fluid is collected in the ventricles, so as to distend them beyond their natural capacity. In this state the membrane is not only more vascular, but also much firmer and thicker than natural. The septum lucidum is sometimes as thick as the dura mater, and very firm; but more commonly, those parts of the membrane which are thickened and rendered opaque, are also soft and pulpy.

35. *Coagulated albumen* is occasionally found on the surface of the ventricles. It is sometimes met with in layers on the corpus striatum and the thalamus. I have found it of great thickness; and in one case, which recently occurred to me at the Children's Infirmary, it nearly filled both ventricles. *Ulceration* proceeding from inflammation is occasionally met with in this surface, particularly in the corpus striatum. It seems generally to arise from the formation of a small abscess or purulent collection under the membrane, which it ruptures, the fluid thus escaping into the ventricle.

36. *D.* Inflamed states of the *pia mater*, with ulceration, puriform secretion, are, as well as other lesions of this description in other parts of the brain, most frequently occasioned by external injuries. Inflammatory irritation, affecting the arachnoid and vascular membrane either of the periphery of the brain or of the cavities, is not an unusual consequence of injuries of a serious character sustained in other parts of the body, as after compound fractures and contusions of the limbs and joints, severe burns, &c. In these cases, a similar state of the membranes, as well as a nearly similar kind of delirium to that which has been called delirium tremens, sometimes occur. Inflammatory states, either with dryness of the membranes, but more frequently with effusions of various kinds, often take place in the progress of acute diseases, particularly fevers, and the exanthemata; from drunkenness, accidents, concussions, or mental excitement; whilst congestions, effusions,

and infiltrations of blood, proceed generally from interrupted circulation through the heart and lungs, narcotic poisons, asphyxia, &c., and frequently are attended with convulsions, stupor, coma, paralysis, &c. The adventitious formations are usually the result of a cachectic habit of body, as scrofula, deficient vital power, and the vitiation of the system by syphilis, and the cancerous or carcinomatous taint.

37. iii. DISEASED STATES OF THE SINUSES OF THE DURA MATER. — *Inflammation* of the sinuses is sometimes observed, in its advanced stages and consequences, and but rarely at the early periods. In this latter case, they manifest chiefly increased vascularity, and redness of their internal lining, with slight thickening and friability, sometimes with softening, and occasionally with abrasion, and give rise to the following changes, seated immediately within the part of the vessel which is inflamed: — 1st, To the coagulation of the blood in contact with, and its adhesion to, the inflamed surface of the vessel: 2d, Subsequent discolouration of the coagulum, and its conversion into a state nearly resembling that of coagulated lymph: and, 3d, The presence of pus, which is usually found in the middle of this coagulum, though not always. *Thickening* of the membranes forming the parietes of the sinuses is occasionally remarked, and is evidently a result of a slow state of inflammatory action, affecting chiefly the fine cellular tissue connecting the serous lining to the fibrous membrane. Sometimes their parietes are remarkably thick and dense, almost approaching to cartilage, this morbid change being chiefly seated in their connecting cellular substance. Firm *fibrinous formations*, or *coagulated lymph*, are also occasionally formed in these vessels; in some cases, conjointly with marks of inflammation in them; the internal tissues of the vessels being red, injected, congested, and of a dark colour; and in others without any very marked appearance of such disease, but with evident thickening of their parietes. In several instances I have observed these formations disposed in the form of false membranes within the sinuses, and adherent to their serous lining. While the more exterior surface of these false membranes, or that next the vessel, is generally firm, the interior of the canal which it forms is soft, and contains a purulent like matter mixed with a concrete albuminous substance.

38. In other instances, no fibrous concretions are formed, nor is the vessel perceptibly inflamed, and yet *pus* is found in parts of the sinuses, either distinct and in considerable quantity, or mixed with firm coagula, or with clots of blood, and in small quantity. In these cases there is reason to suppose that pus has been carried by the veins into this situation from an adjoining part. In some cases it occurs accompanied with an albuminous-like effusion, more or less concrete, or with firm fibrinous coagula, and an inflamed state of the internal membrane of the vessel. In many, the presence of pus is connected with an apparent abrasion, and even ulceration of the internal surface of the sinus; but in others, increased vascularity, with patches of deep redness, or of congestion, with a deep lividity, and, occasionally, slight thickening with diminished cohesion of the parietes of the vessel, are most remarkable. In all these, there can be no doubt that the puriform fluid is deposited in this situation from the surrounding inflamed parietes of the vessel.

39. The lesions now described are most frequently connected, in adults, with chronic disease of the bones of the cranium; and, in rarer instances, with disorganisation of the brain itself and of its membranes. They are most frequent after fractures of the skull, and external injuries: and I believe that they are occasional consequences of the worst forms of erysipelas of the head; a case of this description having occurred to me, in which inflammation of the sinuses of the dura mater was found upon dissection. They are more common in children, according to my experience, than in any other class of patients; particularly from the age of one and a half or two years to ten or twelve. I have observed the appearances now described in several cases of cerebral disease; or, at least, of cases terminating with the usual symptoms of pressure on the brain, following severe states of porrigo, ulcers of the scalp, and chronic diseases of this structure, particularly in scrofulous, weak, and ill-fed children. The observations of M. TONNELLÉ and of M. RIBES fully agree with my experience as to the pathological relations of these lesions of the sinuses.

40. The sinuses also present a *vermilion colour* of their internal membrane, like that which is sometimes found in the arterial system. This appearance is most probably caused by a morbid state of the blood; and it may be, on some occasions, a *post mortem* change, arising from the staining of the internal surface of the vessels by the colouring part of their contents. In respect of the *state of the blood* itself in the sinuses, much diversity exists: the quantity contained by them also varies greatly. More frequently they are empty, or nearly so. When they contain blood, it is in some cases dark, semifluid, or thick; in others, less dark, and more fluid; in the greater number, either altogether or partly coagulated. In a few, it is separated into a serous or serosanguineous fluid, and a fibrinous coagulum having no connection with the parietes of the vessel, the coagulum consisting entirely of the fibrine of the coagulated blood, and not of the albuminous fibrin, or coagulated lymph, already described (§ 36.). In some cases, one or more of the sinuses is filled with a dense, firm, and brown *coagulum*, perfectly continuous throughout; branching even into the veins which open into the sinuses; and not interrupted, soft, and forming variously sized clots, such as are often found after death. This state of the contents of the sinuses is seldom or never connected with inflammation of its parietes, unless the inflammation has occasioned, by means of the albuminous matter effused, a complete obstruction of the vessel, and, consequently, the accumulation and gradual coagulation of the blood beyond it; being a change in these fluids independent of organic lesions of the parietes of the sinus, unless such lesion occasion obstructed circulation through it.

41. The firm, dense, and continuous coagulum now described is evidently the result of a slow coagulation proceeding in the sinuses previous to death; and, in every instance in which I have observed it, has arisen from obstruction in the return of blood from the sinuses, owing to compression of the jugular veins, by tubercles, scrofulous tumours, or other organic changes obliter-

ating the canals of these vessels, or of the sinuses themselves; or from a stasis of the blood, followed by coagulation in these vessels, arising in consequence of great cerebral conjestion, joined with the utmost general adynamia. There is no doubt that the effusion of lymph, in any of its states, or even of purulent matter, will, while in connection with the internal surface of an inflamed vessel, or mixing with the blood in it, dispose this fluid to coagulation; forming a nucleus around which coagulation will proceed, or a point from which it may depart. And such seems to be the source of the more or less extensive and continuous coagula, which we frequently find in connection with inflammatory lesions and formations in the sinuses. But such is not the case here. In the course of an extended experience at the Infirmary for Children, I have observed, in several cases, that this state of dense coagulation of the blood in the sinuses manifestly supervenes before death, owing to the general and local conditions now stated, and gives rise to all the symptoms of more or less complete and sudden compression of the brain, owing to the consequences I am now to notice as arising from it, in common with other causes of obstruction in the sinuses. In cases of this description, if no effusion of blood have occurred, the veins are found generally engorged with dark blood. In some cases, the distension of the veins had given rise to an exudation of blood, or rupture of several of their minute distributions, with copious extravasation of this fluid; and in many, the distension of the veins was accompanied with copious effusions of serum in the ventricles, between the membranes, or in both situations.

42. The *glandulæ Pacchioni* are sometimes so much increased in number and size as to obstruct the passage of blood through the sinuses; give rise to the appearances now described; and thus, as the other changes in the sinuses, terminate in some one or other of the apoplectic states. Mr. Earle (*Medico-Chirurg. Trans.* vol. iii. p. 66.) has observed these glands changed to the appearance of grumous blood, in connection with fungoid disease in the brain. They are more frequently enlarged and hardened; and, occasionally, they cause an absorption of the dura mater, with corresponding depressions in the superincumbent bone.

43. The *bands* which cross the longitudinal sinus are occasionally more numerous than natural; and they are sometimes thickened, particularly in connection with a similar change of the parietes of the sinus.

44. The *veins on the surface of the brain* sometimes contain a few bubbles of air; but it is doubtful whether this is a morbid state or a *post mortem* change. They are occasionally filled with *fibrine*, particularly in those cases which presented a corresponding state of the sinuses. *Pus* has also been observed in them, especially in cases of inflammation, with secretion of pus under the arachnoid.

45. *Ossification* is detected only in the *arteries*; but it occurs in them very frequently, and to a very great extent, particularly in advanced life. The early stages of this change have also been discovered in youth, although rarely. The arteries most commonly found ossified are the internal carotids and the basilar; but the circle of Willis, and the vessels departing from it, as well as the arterial ramifications which appear between the convolutions, and come out upon the surface, often participate more or less in this morbid state. *Cartilaginous* degeneration is still more extensive, and seems to precede the ossific deposits. Cartilaginous and ossific formations in the coats of the arteries of the brain occasion irregular distributions of blood, and interrupted or imperfect supplies of this fluid to some parts of the organ; disposing to aneurismal dilatations, to rupture, and, consequently, to the production of apoplexy and paralysis. In most instances of extravasation of blood in the substance of the brain, this condition of the arteries exists; and is, most probably, the cause of the extravasation, by disposing it to congestion, and rupture from increased action of the heart.

46. *Aneurismal dilatations* of the arteries of the encephalon are by no means very uncommon: they are most frequently met with in the carotids after they have entered the cranium, in the large branches, and in the basilar artery. They may derange the circulation of the brain, or may occasion effusions of either blood or serum, without themselves having been ruptured; but they more frequently break, occasioning apoplexy. The arteries, particularly those about the base of the brain, and some part of the branches forming the circle of Willis, are also occasionally *obliterated* and reduced to a thin chord.

47. II. Lesions of the Substance of the Brain. — The morbid states of the brain have been investigated in modern times with the greatest success and advantage to practical medicine. The labours of Reil, Serres, Lallemand, Wenzel, Gall, Rostan, Abercrombie, Hooper, Craigie, and Duncan, have chiefly tended to this advancement; whilst a number of other enquirers have added much of importance, as well as confirmed the observations of more original enquirers.

48. i. Inflammation of the Substance of the Brain, — *Encephalitis,* — *Cerebritis.* — *A. Acute inflammation* of the brain does not frequently occur as an idiopathic or primary and uncomplicated malady. It is in consequence of previous disease, as fevers, the exanthemata, inflammations of the ears, extravasated blood, tumours and tubercles of the brain, of poisons, and external injury, that it comes most frequently before the pathologist. Resulting from injury, it is generally limited in extent, although intense in degree. The whole brain is rarely or never affected at the same time, but only a part of it; and the disease is seated either in the vascular membrane, or in the cortical substance, or in the medullary matter of the interior parts, of the brain, or in them all simultaneously. The part affected first becomes vascular, and the injection of the vessels proceeds till the cerebral substance displays a red tint, deepening, as the disease advances, until it assumes a reddish brown, and, occasionally, even a brownish or green shade. With this increased intensity of disease, the part becomes softer than natural. The formation of matter, however, is not so frequent a consequence of this form of inflammation as of that of a sub-acute or chronic kind, occurring in persons of a scrofulous diathesis, and unhealthy habit of body, unless when a foreign substance, or piece of bone, has been driven into the brain. Somewhat similar to inflammation,

although decidedly different from it, is that state of *morbid irritation* frequently met with in fevers, especially typhus, eruptive diseases, epilepsy, delirium tremens, tetanus, convulsions, hydrophobia, nostalgia. In these diseases, vascular turgescence and red injection of the brain, are usually seen; but not the general red colouring, the spot-like effusion of blood, and the change of consistence, which characterise acute inflammation of this structure.

49. Acute cerebritis occasions violent headach, intolerance of light, acuteness of all the senses, delirium rapidly succeeded by convulsions, coma, and death. When it arises from morbid poisons affecting the system, as in gaol and camp fevers, purulent formations are more frequently met with, as stated by PRINGLE and others. In these cases the symptoms are somewhat varied; the prostration of the powers of life being much greater, and the delirium of a much lower grade. In those diseases, the *post mortem* inspections, when numerous, will furnish examples of the various stages of lesion, from the first appearances of injection of the vessels to the formation of matter, or complete destruction of the part chiefly affected.

50. *B. Suppuration of the brain, — Abscess of the brain, — Apostema cerebri.* — Collections of purulent matter have been often found in the brain, generally as a consequence of inflammation of a sub-acute or chronic kind. Of this the writings of BONET, MORGAGNI, LIEUTAUD, BAADER, STOLL (*Rat. Med.* i. p. 285.). FRANK (*Acta Inst. Clin. Viln.* Ann. 1. p. 75.), PROCHASKA (*Anat. Acad. Fasc.* part ii. sect. ii. cap. 2.), SCHAEFFER (*Hufeland und Himly, Journ. der Pr. Heilk.* 1809.), PORTAL (*Mémoires de l'Acad. des Sciences,* 1780, p. 315.), LALLEMAND, BAILLIE, BRODIE, POWELL, HOOPER, and ABERCROMBIE, furnish numerous examples. The situations of these abscesses vary considerably, as well as the kinds of abscess formed. *a.* Sometimes the purulent collection is lodged in an irregular cavity, and appears unsurrounded by any distinct cyst. These take place to a greater or less extent, and consist most commonly of purulent matter mixed with flakes of lymph, giving it a slight curdly appearance. They are most commonly found in the anterior lobe of the cerebrum, or in the centre of the hemisphere. Some of the abscesses of this kind seem to consist of several small cavities communicating with each other: these are usually found also in the anterior lobes, the centres of the hemispheres, or near the striated nucleus of REIL. *b.* The next species of abscess consists of a distinct, firm cyst, or even cysts, as observed by LALLEMAND, and seems to have been the result of a slower process of formation, and of a less acute form of inflammation: it contains purulent matter, and is most frequently found in the centre of the hemispheres, particularly just above the central oval of VIEUSSENS, or at its margin. Abscess of the brain has also been met with immediately below the *cornu ammonis;* likewise near the parietes of the small posterior cornu of one of the lateral ventricles, and just below the unciform eminence which rises into the interior of this cavity. In one instance only (*North Amer. Med. and Surg. Journ.* 1818.), have the *tubercula quadrigemina,* and pineal gland, been the seat of abscess.

51. *c.* Purulent matter is also found in some part of the brain, infiltrated, as it were, into the cerebral substance in the form of a number of minute drops, and occupying a considerable extent, but not lodged in any single distinct cavity: the parts surrounding the purulent infiltration presenting scarcely any other appearance of change, excepting more or less softening, which is always present, and seldom any sign of augmented vascular action. This morbid state is frequently observed as the consequence of the transit of purulent matter into the circulation, which, in some cases, is secreted from the vessels in the substance of the brain, giving rise to the infiltration. This phenomenon takes place much more frequently in the parenchyma of other organs, as of the liver, lungs, and spleen, than in the brain. The infiltration, whether proceeding from this source or not, often passes into the condition of distinct collections, varying in number and size; and sometimes they nearly or altogether communicate. In such cases, the cerebral substance separating these collections seems as if it were softened, or broken down into the purulent matter, and often processes of the cerebral structure, still adhering to the surfaces surrounding these collections, are floating in them, appearing as the debris of a portion of the disorganised brain. In these cases an approach is made to the formation of a regular cavity. In other instances, if the disease is less rapid, or does not destroy life before further local changes take place, a distinct cavity is effected, which, at first, consists of the cerebral substance merely, softened, discoloured, and vascular. M. ANDRAL thinks that the following characters presented by the cavities containing purulent matter are the result of subsequent changes which the surfaces of these cavities undergo, and not the result of an original dissimilarity of structure. As to this point, I think his reasoning inconclusive, and his proofs insufficiently strong. It, however, should be admitted, that the purulent infiltrations, and collections in either of the forms now noticed, are those which take place most rapidly, and which are generally observed in *post mortem* researches, in cases of death taking place soon after the symptoms of cerebral disease had supervened; whilst the encysted form, as I have already stated, are those which manifestly form most slowly.

52. *d.* The different kinds of parietes surrounding the collections of matter in the brain, according to this able pathologist, are, — 1st, The cerebral structure itself, which, in recent and acute cases, forms the only envelope of the purulent collection; but which may assume the following appearances successively, according to the duration of the disease. 2d, A cellulo-vascular substance, extending over the whole of the internal surface of the cavity, or merely in parts. 3d, A true membrane, which is as yet soft, and flocculent, but yet admitting of separation from the adjoining nervous substance. 4th, A fine membrane, presenting a distinct organisation, and capable of being detached either in pieces or entire. Once arrived at this stage, their internal surface often has the appearance of villosities, whilst sometimes the cyst is composed of two or more distinct layers, which may be detached from each other. In these cases, the cysts are thick, as remarked by Professor LALLEMAND; the internal layer, or cyst, being of a reddish white, and presenting the appearance of a mucous sur-

face slightly inflamed. In a case noticed by this author, in which three distinct layers, or cysts, were observed, the exterior was cellular, adhering to the cerebral substance; the middle one thick and firm; the interior layer closely resembled a mucous surface. Meckel, however, espouses a different opinion from Andral, as to the formation of abscesses contained in distinct cysts. These are not, according to him, owing to advanced changes in the organisation of the walls of the purulent collection; nor are they to be ascribed to suppuration of the cerebral texture itself; but to inflammation and suppuration of an adventitious structure, developed in the cerebral substance. His reasons for this opinion, are, — 1st, That those cysts adhere but very loosely to the surrounding cerebral texture: 2dly, That this texture is not hardened, but, on the contrary, softened, immediately around them.

53. The cerebral substance in which the purulent infiltrations and collections of the first grade are found, is generally softened, and, excepting when they arise from the absorption of purulent matter into the circulation, more or less injected. In cases of purulent collections contained in more or less distinct cysts, or membranes, the surrounding structures are often but slightly altered, and occasionally not even perceptibly so. But when the collection has much increased, or continued long, the nervous substance surrounding the cyst becomes irritated, inflamed, discoloured, and softened; and then only supervene those symptoms which evince, unequivocally, the existence of abscess or serious organic lesion: for, up to this period, the abscess may have been proceeding, but so slowly as not to disturb the functions of the organ, until, owing to some determining cause, in conjunction with the changes taken place in the cyst, its contents, or with its size, the substance of the brain surrounding it becomes diseased.

54. Abscesses, whether immediately surrounded by the cerebral structure, or contained in more or less distinct cysts, may vary in number from one to six or seven, each distinct from the other, and seated in various parts of the brain. They may present appearances of ulceration in their parietes; and they may be accompanied by a variety of other lesions of the brain and its membranes, generally in different subjects, but occasionally even in the same case. Inflammatory appearances of the membranes; effusions, serous or albuminous, in either the external or internal surfaces of the organ; softening of the structure, tumours, occasionally hardening, &c.; are their usual attendants.

55. *e*. In respect of appearance, the pus found in the brain differs in no way from that formed in other textures of the body. M. Lallemand (*Récherches Anatomico-Patholog. sur l'Enceph.* &c. let. iii. p. 361., let. iv. p. 41.), whose numerous observations of purulent collections in the brain have enabled him to give much interesting information on this topic, states, that he has observed it of a yellowish green tint, yellowish, yellowish white, greenish, greyish, yellowish grey, whitish grey, dirty white, and altogether white. He, as well as Abercrombie, has frequently found it extremely fœtid. This fœtor of the pus I have observed in several cases of abscess occurring in young subjects, from the extension of inflammation of the ear to the brain. In a case of this description, reported in the *Medico-Chirurgical Review* for Dec. 1830, the fœtor of the purulent collection was extreme; and the cerebral substance surrounding it greenish, disorganised, and broken down into the contained matter. Abscesses formed within the substance of the brain occasionally make their way to some part either of the external or of the internal surface of the organ: thus they sometimes break into the ventricles, as in the case just now alluded to: when they open upon the periphery of the cerebrum, they occasionally destroy the bone and intervening membranes in its immediate vicinity, before death is occasioned. M. Andral says, that he has observed an abscess of the brain destroy the cribriform plate of the ethmoid bone, and escape externally through the nasal fossæ: and MM. Itard, Lallemand, and others have shown, that abscess of the brain, from an extension of inflammation from the ear, may destroy the petrous portion of the temporal bone, so far as to admit of the evacuation of the abscess by the ear. In cases originating from this source the matter is frequently contained in no distinct cyst, the cerebral structure surrounding it being generally discoloured, softened, and often appearing as broken down into it. Sometimes the meatus externus and internus are shut up by means of fungous granulations preventing the external exit of the purulent secretion, and hence probably, in some cases, diverting it internally. In some cases more than one abscess, in some instances four or five, seated in distinct parts of the brain, have been observed.

56. *f*. Collections of purulent matter have likewise been found by Bianchi, Stoll, Weickard, J. Plancus, Frank (*De Curand. Homin. Morb.* lib. ii. p. 49.), Nannoni, Perrault (*Journ. de Méd.* t. vi. p. 389.), and Abercrombie, in the *cerebellum*, generally contained in more or less distinct cysts, "the walls of which were membranous and vascular." Matter, indistinctly defined, has been found also in the *medulla oblongata*, generally in small irregular cavities, "especially in that part of the olivary body which contains the corpus dentatum." (Craigie, *in opus. cit.* p. 386.) Dr. Abercrombie mentions a case where it was met with at the junction of the protuberance.

57. *g*. These collections are evidently the result of inflammation, but of a peculiar and slow character, probably owing to the constitution of those in whom they are most frequently found, and who are generally of the strumous diathesis. The encysted abscess seems to take place very slowly, and to be analogous to what has been commonly called *chronic* or *cold abscess*. The purulent infiltrations occasionally met with in the large nervous masses, as well as in other viscera, from the absorption of purulent matter into the circulation, evidently take place with great rapidity, and are a result rather of morbid secretion, than of inflammation.

58. *h*. Abscess of the brain is very frequently met with as a consequence of purulent *discharge from the ear*. This affection of the ear, when it has not apparently proceeded from inflammatory sore throat, and the extension of the inflammation along the Eustachian tube, is very generally connected with a sub-acute or chronic inflammation of the dura or pia mater of the brain; and is thus frequently extended to the substance of the brain

itself, terminating at last in abscess in this situation. This has been satisfactorily shown by MORGAGNI, ITARD, POWELL, LALLEMAND, DUNCAN, ABERCROMBIE, CRAIGIE, and others. BONET, and, more recently, Mr. BRODIE, supposed that the affection of the ear was consequent upon that of the brain, or at least coeval with it; and hence they ascribe the discharge from the ear to the inflammation of the membranes having extended itself from the dura mater of the temporal bone to the tympanal cavities. When abscess of the brain takes place owing to the affection of the ear, they consider it an extension of the inflammation from the membranes internally to the substance of the brain, in consequence either of the unhealthy habit of the patient, or of improper treatment, by suddenly suppressing the discharge, "and converting a chronic external inflammation into an acute internal disease;" the external discharge having been, as it were, arrested and turned in upon the cerebral substance. The only question here is in respect of the particular parts in which the inflammation originates; as to the consecutive phenomena, there seems to be no difference of opinion: and this point can be decided by the symptoms only, and the order in which they occur. If the purulent discharge take place without any previous internal and deep-seated pain, and the dangerous symptoms follow upon the suppression of the discharge, we may infer that the disease has commenced in the ear, and extended itself to the membranes and brain itself. This is, perhaps, the most frequent procession of the morbid phenomena. But, occasionally, a different course is manifest, especially in delicate children, and patients of a strumous diathesis. In these, symptoms of disease of the brain or its membranes are very manifest before the discharge takes place; and when it does take place, either the patient recovers under judicious management, or, upon the disappearance or suppression of the discharge, a sudden exacerbation of the symptoms are observed, with delirium, coma, convulsions, &c. followed by death. Such is the result of my experience in a very great number of cases which have come before me; so that I am led to conclude that, whilst the opinion adopted by MORGAGNI and his followers, on this question, is often correct, that espoused by BONET and BRODIE is not wholly without foundation.

59. But it is not infrequently observed, (and I have met with several instances in grown up persons,) that patients have been occasionally liable, for years, to a puriform discharge from the ear, — occasionally from childhood, with little remission, and with little or no further ailment. This sometimes gradually diminishes, or suddenly disappears; when either soon afterwards, or not until several months subsequently, or even after a year or two, dangerous symptoms of diseased brain supervene, and rapidly advance to a fatal termination; and upon dissection, inflammation of the membranes of the brain of the same side of the body with the affected ear is observed, and in the substance of the hemisphere is found a large purulent collection with inflammation and softening of the cerebral matter surrounding it, the cavity presenting an irregular soft surface.

60. The following *cases* strongly illustrate this: — 1st, A young gentleman had, from childhood, a slight purulent discharge from the right ear, until nearly the period of puberty; about which time it gradually disappeared. He had nearly lost the sense of hearing on that side. He went into the public service, in which he continued for several years, until, about the age of thirty, he was suddenly seized with intense pain of the head, fever, followed by paralysis of the whole left side of the body, insensibility, involuntary motions, coma, shortly terminating in death. On examination, thickening of the membranes of the right side of the brain, with adhesions, softening of the cerebral structure, and a purulent collection nearly in the centre of the middle lobe of the hemisphere, were found. I very recently witnessed a nearly similar case, to which I was called by a neighbouring practitioner; and a third case, in which I had ventured to predict similar lesions in a person advanced in life, but which we were not permitted to verify by a *post mortem* inspection.

61. Abscess of the brain consecutively on purulent discharge from the ear, is most frequently observed in young subjects, particularly in those of a strumous diathesis. From what I have said, it must not be inferred that abscess of the brain is the only unfavourable consequence, or even the most frequent one, owing to an extension of the inflammatory action from the ear or cerebral membranes; for other lesions accompany it. But, whether the abscess proceed from a gradual extension of disease, as now stated, or be a vicarious result of the suppression of the external discharge, — in which light it may sometimes be justly viewed, — there are generally found, upon examination of the surrounding parts, increased vascularity, softening of the cerebral substance, and an irregular, soft, and vascular cavity, containing the purulent matter. Added to this, there are also inflammation, thickening, and suppuration of the membranes; the pia mater being injected, and covered with lymph; the dura mater thick, opaque, dark coloured, more readily torn, and detached from the bone underneath it, which is also discoloured, and sometimes carious.

62. Abscess of the brain is very often a consequence of external violence; but it is one which takes place at extremely indefinite periods from the receipt of injury, and which often has little or no relation to the extent of the external mischief. The period which elapses from the external violence to that full developement of the abscess which is incompatible with the duration of life, according to the observations of PIGRAY, MORAND, PROCHASKA, THILENIUS, HOME, DENMARK, and others, varies from two or three months to as many years. A case which I had an opportunity of observing in a public institution, and in which the operation of trephining had been performed, presented a large abscess in the hemisphere, underneath the seat of injury, between three and four years from the time at which it had been sustained. The perforation made by the trephine was completely filled with ossific matter, which extended in a radiated manner from the edges of the perforation towards its centre.

63. Dr. BAILLIE says, that when suppuration of the brain takes place from internal causes, it is generally in the substance of the organ; but when it arises from external violence, it affects only the surface. But as Dr. CRAIGIE has very

justly remarked, this distinction does not always hold good, and requires modification.—"1st, Where a long interval elapses after the infliction of the injury, the collection of purulent matter is almost invariably deep-seated. 2d, In like manner, when the injury operates in the manner of counterstroke, the collection is also often within the substance of the organ." 3d, In some instances of suppuration after injury, the collection does not take place at the part where the blow struck the skull, but either in the line of the force passing through the brain, or in some of the lines into which this force may be resolved. 4th, It is chiefly when this force has been directly expended on the part, *i. e.* when the bone has been immediately broken, and its membranes injured, that suppuration takes place on the surface of the brain: it is then the result rather of the injury of the membranes, especially of the pia mater, than of the cerebral substance itself.

64. Suppuration may occur in any part of the brain; but it is most frequently met with in the hemispheres, as shown above (§ 50.). Its effects vary exceedingly, according to the situation and extent of the purulent collection; but are not essentially different from those which follow upon the slow effusion of blood, the presence of tumours, or other morbid formations. I have already hinted at the occurrence of suppuration in parts of the brain in the course of fevers, especially those which are of a malignant character, or which are complicated with inflammatory action of the brain. Such occurrences have been observed by Pringle, Borsieri, Eisfield, Ploucquet, Clutterbuck, Marcus, Jackson, and Mills, and many others. But this falls under the pathology of, and morbid appearances in fevers, where the subject has received due attention.

65. *C. Ulceration.*— To ulceration of the brain authors have attached no precise idea, they differing widely as to what should constitute ulceration of the cerebral texture. According to the opinions of some, those solutions of continuity, sometimes observed in the most advanced degrees of pulpy destruction of the brain, about to be described (§ 72.), are nothing else than ulceration; and certainly, if there were appearance of any considerable loss of substance by absorption, the lesion would be legitimately ulceration. The case recorded by Morgagni (*De Sed. et Caus. Morb.* ep. xi. pars ii.), in which he described the *corpus striatum ab reliquo cerebro omnino separatum inventum est*, which is so singular, may be referred to ulceration. By ulceration of the brain, Dr. Craigie understands destruction of part of either of its surfaces, "so as to present a hollow or depressed surface, rough, irregular, and covered partially either with bloody or albuminous exudation." This seems sufficiently precise; and excludes those doubtful cases of ulceration sometimes consequent upon effusions of blood, the advanced stages of softening of the organ, and the formations of abscesses existing in the substance of the brain, where, although a breach of continuity of structure is produced, yet the removal of it by absorption cannot be demonstrated. Cases of this description are more legitimately examples of pulpy destruction, or suppurative disorganisation, than of ulceration. With this limitation of ulceration and erosion to the various internal and external surfaces of the brain, M. Andral agrees with Dr. Craigie. This species of lesion, although not of frequent occurrence, is yet occasionally met with. Besides the case given by Morgagni, and already referred to, another is mentioned by him in the same epistle. Instances of this disease have also been recorded by Bonet (*Hist. Anat. Med.* part iii. Ob. 108. 138.), Wepfer (p. 212.), Morgagni (*Epist. Anat. Med.* iv.), Lieutaud, (*Hist. Anat. Med.* let. iii.), Senac, Valsalva, Portal (*Anat. Méd.* t. iv. p. 98.), Howship (*Med. and Phys. Journ.* March, 1810.), Anderson (*Transact. of Royal Soc. of Edinburgh*, vol. ii.), Ridley, Haller, Stoll (*Ratio Med.* pars iii. p. 122.), Powell (*Case* 6. *Transact. of College of Physicians*, vol. v. p. 96.), and Scoutetten (*Archives Gén.* t. vii. p. 31.), who have met with it on the convoluted surface of the brain, on the foliated surface of the cerebellum, and in the surface of the ventricles,—parts in which this morbid change is chiefly found. As shown by Haller (t. iv. p. 351.), Stoll, and Scoutetten, ulceration of any part of the brain's surfaces is always attended with an inflamed, or otherwise unsound state of the pia mater, and occasionally with softening of the parts underneath, sometimes limited to the grey substance, but at others proceeding further. In the two cases recorded by M. Scoutetten, the adjacent brain was somewhat softened, and in one of them, of a wine lees colour. The ulceration in the first case existed on the inferior surface of the right anterior lobe, and presented a hard, dry, irregular, yellowish surface, thirteen lines long and eleven broad, with singularly indented edges. This patient died with symptoms of irritation of the digestive canal, and of the brain. He experienced a constant acute pain at the bottom of the orbits. In the second case, the extremity of the posterior lobe presented two small ulcerated patches, one much larger than the other, and of an oval form. They penetrated no deeper than the cortical substance. This patient had been seized with gastro-intestinal irritation, and complained of no pain in the head. During the latter stage of his disease, he became delirious. In both these cases the surrounding pia mater was injected, and somewhat eroded; so that we may infer from these, and other cases upon record, that ulceration of the brain is a consequence of circumscribed inflammation of the pia mater.

66. The *existence* of ulceration of the brain is indicated by headach, partial convulsions, sometimes epilepsy, palsy, loss of memory, hebetude, coma, and exhaustion. In some cases the headach is intermittent, and the palsy is generally on the side opposite to that in which the lesion is found. In the case recorded by Dr. T. Anderson, and in which most of the symptoms now noticed were present, there was a superficial loss of substance from ulceration, two and a half inches long, one and a half broad, and nearly an inch in depth, situated on the upper part of the right hemisphere of the brain. In the bottom of this cavity were found some thin laminæ of a brownish matter, with stony concretions, some of which broke into sand upon the slightest touch.

67. *D. Sphacelation* or *mortification* of the cerebral substance is rarely met with, and chiefly as a result of external injury, when it has been

bruised and acutely inflamed. In this state of disorganisation, the cerebral substance is dissolved, of an orange brown colour, or of a greyish black, and fœtid. This alteration seems to be rarely produced by internal causes, and is to be distinguished from the pulpy softening of the organ. Dr. ABERCROMBIE, however, considers this latter change to be identical with gangrene.

68. ii. SOFTENING OF THE BRAIN.—*A. From serous infiltration,—Œdema of the brain.* Infiltration of the substance of the brain with a watery fluid has been noticed by GUERSENT and ANDRAL,—by the former in children, by the latter also in adults. In these cases the serum may be diffused in the nervous substance, or contained in more or less distinct cavities. This change is most frequently observed in the white central parts of the organ. It has not generally been remarked in connection with any particular symptom; but it has, in a few instances, co-existed with dropsy of the ventricles; and, in adult subjects, with general leucophlegmatia and cachexia.

69. *B. Simple diminished consistence of the brain, without change of structure,—Malakencephalon* (CRAIGIE),—seems to be a different state of the organ from that which constitutes the *ramollissement*—softening, or pulpy destruction of the brain. In this latter more or less disorganisation is manifest, and generally some change in its colour; but the former is merely diminished consistence, greater flaccidity, and decrease of its natural firmness, toughness or tenacity, and of that clamminess or viscid feeling which it usually communicates to the touch. This state is commonly attendant on low or malignant fever, and on chronic diseases, particularly pulmonary affections, marasmus, diabetes, dropsies, mesenteric and visceral affections. It generally affects the whole organ, and, indeed, the whole cerebro-spinal axis; whereas the pulpy destruction of the brain is more or less limited in extent, affecting parts of the organ in a particular manner.

70. In *dropsies*, the brain is often flaccid, more easily lacerated, and of diminished consistence throughout. This state proceeds either from diminished nutrition of the organ, or from an interstitial deposit of serous fluid with its minute atoms, and defective vital cohesion of its substance. The proper texture of the part is not otherwise changed. *Diabetes* sometimes occasions a similar state, and most probably from diminished nutrition added to a deficient vital cohesion of the structure. In *pulmonary consumption*, and in chronic bronchitis, the brain is very commonly found softer than natural throughout; and this softness is the more marked, the more chronic the pulmonary affection has been, and the more complete the emaciation. May not this state be considered as analogous to emaciation of other parts? the molecules of matter removed by interstitial absorption of the texture of this organ being replaced by a serous effusion, owing to the cranium being a shut cavity, which must necessarily, during the life of the subject, always be in a state of repletion. In such a case, the density of the brain is actually diminished. MECKEL states, that he found a cube of six lines, taken from the brain of a man dead of phthisis, 1¼ grain lighter than the same bulk of a sound brain. Dr. MONRO has found the brains of condemned felons extremely soft, particularly internally, (*The Morbid Anatomy of the Brain*, vol. i. p. 35. and 100.). LITTRE, however, states, that the brain of a felon, who committed suicide, was extremely dense and firm, (*Histoire de l'Académie Royale des Sciences*, Ann. 1705.) TULPIUS, KERKRINGIUS, KING, SCHEIDE, MORGAGNI, GREDING, &c. have found the brain frequently soft and flaccid in fatuous persons, as well as in epileptics, and epileptic maniacs. GREDING (*On Ludwig's Adversaria*, t. ii. part iii. p. 533.) found in about one half of the last named class of subjects, the brain very soft throughout, particularly in its central parts; and Dr. HASLAM's observations (*Observations on Madness and Melancholy*, 2d edit. Cases, 4. 10. 18. 25. 28. 30. 37.) in some degree confirm these statements. But it should not not be overlooked, that the brain of epileptics and maniacs is found also more than usually firm. The diminished consistence of the brain of condemned felons has been attributed to confinement, inactivity, and low diet. Whether these may have a greater influence in causing it than the mental distress to which these persons are reduced, it may be difficult to determine; but if the former be the cause of this state of the organ in felons, it may be equally so in maniacs, who are generally also subjected to confinement and low diet. The diminished consistence now described, is more or less universal, although more remarkable in particular parts, and it generally affects the whole cerebro-spinal axis. Whereas the morbid softening, or pulpy destruction, about to be described, is generally limited in extent. The former also seldom presents any very sensible change from the natural colour of the part; whereas with pulpy destruction there is a more or less evident discoloration.

71. *C. Pulpy destruction,—Softening,—Ramollissement,—Encephalitis sub-acutus,—Cerebritis sub-acutus et chronicus.*—Softening of the substance of the brain has generally been ascribed to a sub-acute inflammatory action, especially by MORGAGNI, ROSTAN, LALLEMAND, BOUILLAUD, PINEL, OLIVIER, and VELPEAU, to whom we are chiefly indebted for having directed attention to this particular lesion. There are others, however, as RECAMIER, who consider this change as the effect of a morbid nutrition of the part, rather than as a result of inflammatory action. By softening of the brain, must not be understood that soft state of the organ which is always present in early infancy, nor the less consistent state of the organ sometimes observed in some chronic diseases, and in certain forms of fever, and already described. It should also be recollected, that all parts of the brain possess not the same degree of firmness; for, if the mesocephalon be as soft as a lobe of the cerebellum, it is undoubtedly in a morbid state.

72. Softening of the brain presents various degrees. The least change of consistence of the part can be recognised only when it is touched. In a more advanced degree, the softening is obvious to the sight. In a still farther advanced grade, the cerebral substance is nearly liquid, and has almost entirely lost its organisation; and in its place there is a mere loose cellular substance, soft and gelatinous, appearing as the original matrix of the structure; and in the last and most advanced stage of all, there is a perfect dissolution of the part, and breach of continuity.

In the cases of this description published by MM. RULLIER and VELPEAU, the disorganisation was so complete, that the filaments of the delicate cellular substance, forming, as it were, the matrix of the structure, were suspended in the middle of the diffluent matter into which the cerebral substance was changed. In the case observed by M. VELPEAU, the solution of continuity was still more complete. From the inferior margin of the mesocephalon to the base of the pyramidal bodies, a substance entirely liquid, which no longer retained the appearance of nervous substance, occupied the place of the bulb of the chord; and through the whole of this space there existed neither arachnoid nor pia mater.

73. The softened portion of brain presents various shades of colour. 1st, It may be of the natural or healthy colour of the part, — even although the softening has advanced to such a degree as to form a diffluent pulp, (ANDRAL, LALLEMAND). 2d, It may be perfectly colourless; of a dull white resembling milk; and occasionally the whiteness of the part assumes a clear, or brilliant hue. 3d, The shades of colour sometimes are the following: — a rose tint, an amaranthine red, reddish brown, the colour of wine lees, violet, yellowish, greenish yellow, light grey, and dark grey. Besides the above appearances, the softened part of the brain may be, — 1st, The seat of effusions of blood, which are sometimes small, relatively to the degree of softening, or to its extent; at other times very considerable compared with the softening itself: 2d, Pus may be infiltrated throughout the part which is softened; or the pus may exist in it in the form of one or more distinct collections. M. LALLEMAND considers, that in all softenings of the brain of a white colour, this appearance is owing to the infiltration of purulent matter through the softened structure. MM. ROSTAN and ANDRAL espouse an opposite opinion, on the grounds that, in many softened portions of the brain of this shade, no pus could be detected. The softened part of the brain is generally inodorous; but M. BILLARD has remarked, in the case of an infant, the smell of sulphuretted hydrogen. Softening, attended with the odour observed by this author, seems to have constituted what was called by the older writers, gangrene of the brain.

74. There is no part of the brain or cerebellum in which softening has not at some time or other been detected. Generally those parts which are most obnoxious to hæmorrhage are most liable to softening, such as the optic thalami, and the corpora striata, and the parts in their vicinity. It also as frequently affects the cortical substance, as the medullary texture. In the cerebral hemispheres, the softening may be seated in the *cortical substance* of the convolutions, the white medullary structure remaining unchanged, where it may often escape detection, owing to such limitation; and it is usually an attendant upon active inflammation of the membranes of the brain. When the grey part is softened, it generally separates along with the pia mater, on attempting to raise this membrane. When softened, this portion is commonly also redder than natural; sometimes, on the contrary, it is paler than common. The *medullary structure* situated above the lateral ventricles is very often the seat of this species of lesion. This mass may be altogether softened, or in a few small points merely, each point being quite isolated from the other. The symptoms, however, resulting from this smaller extent of morbid change may be as severe as those arising from the more extensive and more intense lesion. When one of the hemispheres is softened near to its external surface, the circumvolutions are flattened, and often evince a species of fluctuation. M. ANDRAL has remarked, in some cases, the existence of softening of the parietes of the ventricles, with the presence of a turbid fluid effused into them. (*Anat. Pathol.* t. ii. p. 802.)

75. The optic thalami, the striated bodies, and parts in the vicinity of these; the cornu ammonis, and the eminences in the interior of the digitated cavities of the lateral ventricles, the commissures of the hemispheres (*corpora callosum, septum lucidum, &c.*), have all been observed the frequent seats of softening; sometimes limited to one or other of them only, at other times extending to two or more, and occasionally co-existing with signs of inflammatory action, or with effusion of a serous fluid into the ventricles. Softening of the other parts of the encephalon is not so often met with, as of those now enumerated; yet has it been seen in the mesocephalon, in the various parts of the cerebellum, in the medulla oblongata, and spinal chord.

76. Softening of the brain may be limited to one part, or it may exist in several parts, even in both hemispheres, in the same case; and it may affect these different parts at the same time, or successively, either as respects the brain merely, or as regards the whole cerebro-spinal axis. Instead of being partial, which is its usual form, the softening may be so general, and to so intense a degree, that the brain is almost reduced to a pulpy matter, evincing scarcely any appearance of organisation. So general and great a change is very rarely met with in the adult; but it is occasionally observed in infants. M. BILLARD has met with ten instances of it, and I have also found it in some cases of young children: the odour of sulphuretted hydrogen, first noticed by M. BILLARD, was sensible in these; and he found it present in all his cases, which were chiefly of infants only a few days old.

77. Softening of the cerebro-spinal axis is met with in patients of all ages. According to M. ROSTAN (*Récherches sur Ramollissement du Cerveau*, 2d edit. p. 155.), whose attention has been directed, at the Salpêtrière, to this lesion in a special manner, it is very common in old subjects; even more so than sanguineous apoplexy. The researches of LALLEMAND, ANDRAL, and others go to confirm this opinion, and to show that it is also common during early and middle age, although less so than in old age. And I perfectly agree with M. BILLARD in considering it common in children, especially infants. He believes, and I think with justice, that it commences in some cases even before birth.

78. There still remains an important question to be discussed, namely, what is the origin and nature of the softening which has now been described? M. LALLEMAND conceives that it is a constant and necessary result of an acute, subacute, or chronic inflammatory irritation of the part. M. ROSTAN, who has examined this subject with great care, and viewed it in various lights, as respects both the morbid appearances

and the symptoms accompanying them, concludes at last by confessing its difficulty, and considering this change as analogous to senile gangrene. Before the question can be entertained with precision, we should previously enquire with what other morbid states of the system generally, and of the brain in particular, has softening been found allied? 1st, It has been observed by Jemina, Black, myself, and others, to supervene during fevers, especially those of an epidemic and malignant character. 2d, It has been seen connected with puerperal disease of a malignant nature; and with epidemic and infectious erysipelas. 3d, It has been found in cases of scorbutus, and to occur in persons of an unhealthy and cachectic habit; also in those whose powers of life have been exhausted by bad living and excesses.

79. As to its relation to other lesions of the brain, I may state that it is often found surrounding *extravasated blood* in the brain, and intimately connected with this effusion. The softened part is then generally of the colour of wine lees, of a brownish hue, sometimes tending to green, or of a grey or ash tint. But what is the nature of this connection? M. Rostan contends, that the softening precedes and is always the cause of the effusion, owing to the destruction of the minute capillaries at the point where the softening is greatest; whilst Dr. Craigie and others consider the softening surrounding the effused blood as the consequences of such effusion; and chiefly because, "in cases in which death takes place early, the pulpy disorganisation is less complete than those in which it takes place at a later period. In short, the extent of the disorganisation is proportionate to the interval which elapses between the effusion of the blood and the period of death." But is this the fact? It certainly is not in accordance with my experience, for I have observed no such relation; but have found recent effusions surrounded by as great, and even a greater, extent of softening as effusions of an older date.

80. Pulpy softening may be the attendant upon a *coup de sang*, or sudden congestion of the venous capillaries of some part of the brain. This is considered to be the case in softenings with the reddish, amaranthine, crimson, or reddish brown shades of colour. But is the softening a consequence, or a cause of the injection? May it not be a state of the vessels preceding that of effusion? These are questions which large experience and deep thought will not readily decide. Dr. Craigie thinks that the softening is a consequence of the blood-stroke; but I cannot agree with with him, merely because the reasons for a contrary opinion are quite as strong as those which may be urged in its favour. It has been often found accompanying hydrocephalic effusions, by Rostan, Lallemand, Billard, Otto, Andral, and by the author. It is then generally of the lighter shades of colour, and not great in degree. Is it here a consequence or a cause of the serous effusion? It may be either. I am more inclined to consider both lesions as being often coeval, and, whether consecutive or not, depending upon a similar state of the vessels and vital manifestations of the organ and system generally.

81. Softening, or pulpy destruction of a portion of the brain, has likewise been found surrounding tumours and abscesses, by Morgagni, Sandifort, Meckel, Lallemand, Blane, Yellowley, Powell, &c., and presenting almost every variety and depth of shade already noticed. In these cases, especially in those where purulent matter is lodged in the substance of the brain, without any intervening cyst or membrane, the softening often amounts to disorganisation, and is more clearly attributable to inflammatory irritation. When it is found subsequently to injury of the brain, external violence, and inflammation of the brain and its membranes, its nature and origin are most manifest. That it does supervene in this way, is shown by Fantoni, Morgagni, Le Dran, Schmucker, O'Halloran, Dease, Abernethy, Thomson, Hennen, Abercrombie, and others. The apparently unequivocal origin of this lesion in inflammation, under these latter circumstances, induced Morgagni, Lieutaud, Jemina, and more recently Baillie and Abercrombie, to consider it as analogous to gangrene in other structures.

82. But it should be kept in recollection that this state of the cerebral structure, although often preceded by signs of inflammation, and exhibiting in the parts surrounding it inflammatory appearances, is often neither preceded by the one, nor accompanied by the other, but, on the contrary, with a directly opposite train of phenomena and state of parts. In these opposing cases, what is the origin of the disease? Are we to infer, with Recamier, an entirely opposite origin to that of inflammatory action, and that, as the softenings observed in the brain betray a variety of characters, therefore they ought not strictly to be referred to a single unvarying source?

83. From what I have seen of, or read concerning, this lesion, I should infer, in respect of either of its most manifest conditions, that it is an effect of different states of morbid action, but most frequently of a form of sub-acute inflammation, characterised by deficient power and loss of the vital tone and cohesion of both the vessels and the substance of the brain,—that it is the result of deficient vitality of the extreme capillaries and cerebral structure, occurring either primarily, or in consequence of previously excited action. The circumstances in which it is observed; its occurrence after injuries and bruises, from the pressure of tumours, &c., and during the progress of malignant diseases, show that it is not produced by a sthenic or healthy form of inflammatory action; but by that unhealthy, disorganising and diffusive kind observed in cachectic habits, or in persons whose vital powers are much reduced. At the same time, I think it cannot be denied, that it sometimes originates in a different way, being preceded by no signs of inflammatory irritation, nor attended with inflammatory appearances, and is a simple consequence of diminished, or altogether lost, vital power and cohesion of the part affected.

84. iii. Hæmorrhage.—*Sanguineous effusion* may occur in a primary form, but more commonly from some morbid state of the vessels, or of the substance of the brain itself. It may take place in any part of the organ, but much more frequently in some situations than in others. *a.* Blood is effused on the external surface of the brain, either in small quantities, beneath the pia mater, in one or two anfractuosities; or in an

uniform layer, even extending over the whole of an hemisphere in rare cases. *b.* It is sometimes found in large quantities in the ventricles; but it generally has escaped into them, owing to laceration of the cerebral substance in which the extravasation takes place. *c.* The hæmorrhage most frequently is in this substance. M. Andral states, that in 392 cases of hæmorrhage in the brain, its actual seat was in some part of the cerebral substance in as many as 386. Of these, 202 occurred in the *corpora striata*, and *thalami optici*, and parts in the hemispheres, on a level with these places. The cavities formed by the extravasated blood vary in size, from that of a small pea, to the greater part of the extent of a whole hemisphere. When the effusion is very large, it generally ruptures the parietes of the lateral ventricles, sometimes tearing the septum lucidum, and destroying the fornix. In other cases it may make its way to the exterior of the brain, and spread itself over the cavity of the arachnoid.

85. The number of hæmorrhagic cavities found in the brain vary from one to many. When several are found in the same brain, they generally present different appearances, owing to their having been formed at different periods. This is generally the case when the patient has experienced several attacks of apoplexy or palsy. M. Andral remarks that effusion of blood seldom occurs in the cerebellum without appearing also in the cerebrum, whereas it may take place in any part of the cerebral hemispheres without occurring elsewhere. I have stated in the article on Apoplexy, the periods of life at which hæmorrhage in the brain is most frequently met with. Instances have occurred to MM. Rochoux, Billard, Serres, Guersent, and myself, in which it has taken place at the unusual periods of infancy and childhood. The changes that take place in the effused blood, in the cavity containing it, and in the substance of the brain after hæmorrhage, comprising the reparative processes consequent upon it, are fully described in the article Apoplexy (§ 35—39.). I have there shown that the cysts remaining after the coagula have been absorbed, sometimes disappear altogether by adhesion of their parietes. Some pathologists suppose that the cerebral fibres in those cases are directly united, and refer to the experiments of Fontana, Haighton, Michaelis, and Mayer, who had shown, in opposition to Arnemann, that the filaments of divided nerves are, after a time, directly produced in the direction of their axis across the cicatrix. But intimate examination of the cicatrix of a lacerated portion of brain, or of a hæmorrhagic cyst, shows that this does not take place in the medullary structure of the brain. (See Apoplexy, § 53.)

86. iv. Hypertrophy and Atrophy of the Brain. — *A.* The brain occasionally presents lesions evidently connected with a *modification of the nutritive process.* In such cases, the consistence and size, either of the whole, or of certain of its parts merely, are altered. Changes of its consistence are more frequent than of its size, and both are occasionally conjoined. It should not be overlooked, however, that the consistence and size of the organ are modified from the usual standard of middle age, at both the earliest and most advanced epochs of life; and that these modifications, as being its natural conditions at those terms, are to be distinguished from the alterations occasioned by disease. One hemisphere may also differ from the other, in respect both of its volume, and the form and size of its convolutions, owing to original conformation, without occasioning any appreciable disorder of function.

87. The brain continues to increase in size until manhood; from this period until old age its volume continues the same; but with extreme age it somewhat diminishes in bulk. This is, however, not an uniform occurrence, for disease may have cut short existence before the period had arrived at which the organ would have undergone this change. According to Cazanvieilh, the longitudinal diameter of the brain of an old man, compared with that of one in early life, is 6 inches 1 line French measure for the former, and 6 inches 4 lines for the latter; whilst the transverse diameter is 4 inches 10 lines, and 5 inches, respectively. M. Desmoulins (*Anat. des Syst. Nerv. &c.* t. ii. p. 620.) found, that in persons above seventy years of age, the specific gravity of the brain was from one twentieth to one fifteenth less than that of the brain of persons just arrived at manhood.

88. The *convolutions* of the brain are scarcely developed at birth, or even until the expiration of the first year. In old age they again become less distinct and prominent. In the brain of the full grown young subject, they vary in thickness from three to five lines, whilst they are usually about two or three lines in old persons. They present the greatest diversity in respect to their number and length, and the depth of their anfractuosities in the adult: in general they are the most marked and developed in the largest brains. Several physiologists in France are of opinion that the developement of the faculties of the mind has a very intimate relation with the extent and number of the convolutions of the hemispheres, and the depth of their anfractuosities.

89. But it is important for the physician to know that not only may the whole encephalon experience a diminution of its bulk and specific gravity with old age, but that this diminution may be particularly apparent in certain parts of it in preference to others; and it is presumed, that this change may sometimes commence in one portion previously to others, or may affect it alone, so as to disturb its functions without being so evident upon dissection as to attract notice. The comparative length of the following parts of the encephalon of subjects just arrived at puberty, of those in the prime of life, and of aged persons, is here given, as furnished by M. Cazanvieilh in French measure: —

Persons at Puberty.				*In the Prime of Life.*		*In Old Age.*	
		in.	lines.	in.	lines.	in.	lines.
Thal. optici -		1	5⅓	1	6	1	4½
Corp. striata -		2	6	2	6	2	4½
Corp. callosum		3	4⅓	3	5	2	7
Mesocephalon	length	0	10	0	11	0	10½
	breadth	1	0	1	1	1	0
Cerebellum	length	2	2	2	3	2	3
	breadth	3	9	3	9	3	9

90. From these data it will appear, that the cerebellum is the only part of the encephalon which is not diminished by old age. But it may be asked, do the large nervous masses experience

any diminution of volume analogous to that which the muscular textures and other parts experience in chronic diseases? In answer to this, M. DESMOULINS states that the brain, although atrophied in the manner stated above by old age, suffers no diminution of its bulk, whatever may be the degree of marasmus to which the individual may have been reduced. In all such cases he has also found the brain of the same specific gravity; and, to this predominancy of developement which the brain thus has acquired over all other organs, he is inclined partly to impute that nervous susceptibility and excitation, which are common to the last stages of those maladies. It ought, however, to be borne in recollection, that, although the nervous centres may not undergo any change in bulk or specific gravity in consequence of those diseases, they often experience a very marked diminution of their consistence, as we shall have to show in the sequel. Having been made acquainted with these modifications of the nutrition of the encephalon which it undergoes at the different epochs of life, we are the better able to recognise those which are the result of disease.

91. *B. Hypertrophy*, or *morbidly increased bulk of the brain*, is very rarely met with. This state of the organ is to be distinguished from the apparently augmented bulk, arising either from increased vascular action, or congestion of the vessels. It appears to consist of an actual increase of the molecules of matter composing the proper tissue of the organ, and not of an injection of the minute vessels distending its structure. Although this condition of the brain seems to have been known to MORGAGNI, it is to LAENNEC that we are indebted for precise information respecting it. He stated (*Journ. de Corvisart, &c.* t. ii. p. 669.), that, upon opening the heads of patients who had been thought to have died of hydrocephalus, he found no fluid effused; but the brain presented appearances of great compression, which he could attribute to no other cause, than to a too active nutrition of its structure, giving it a bulk too great for the bony case containing it. In children especially, who had died in convulsions, or who had been subject to epilepsy, this disproportion between the capacity of the cranium and the bulk of the encephalon has been witnessed by him on several occasions, the convolutions of the hemispheres being flattened, and apparently squeezed against each other. M. DANCE has also described this state of the brain (*Repertoire d'Anatomie*, t. v. 1828.), and furnished some cases in which it was observed. It is chiefly met with in children or young subjects, and is, I conceive, of very rare occurrence, since, from amongst the great many thousand cases of children's diseases which have come before me, I have only remarked three cases in which it was unequivocally present. In these it presented the following characters: — The convolutions of the hemispheres were extremely flat, and closely pressed against each other, so that the separations between them were scarcely apparent. The cerebral structure was firm, and, when incised, was dry, and more than commonly destitute of blood. The ventricles seemed small, were closely pressed together, and almost dry. The bones of the cranium were either natural or thicker than usual, as if they had participated, as regarded their thickness, in the increased nutrition of their contents: the dura mater adhered closely to the cranium. A similar augmentation of the thickness of the cranial bones, but to a greater degree than I have remarked it, has been recorded by M. SCOUTETTEN, who met with it in a girl five years of age, who died of abdominal disease, and who had never complained of any disorder of the head, or of disturbance of the mental faculties, which were those common to children at her age.

92. *Rickety hypertrophy* of the brain is more frequent. It commences soon after birth, and often attains a great extent. OTTO supposes that brains which have been much expanded by dropsy in youth, become subsequently, in rare instances, cured by increased deposition of cerebral matter; and thus retain their size and weight. The distension of the cerebral substance by the accumulation of fluid in the ventricles, cannot be comprehended under hypertrophy of the organ.

93. M. ANDRAL (*Anat. Path.* t. ii. p. 776.) says, that, although hypertrophy of the brain is *usually general*, and extends to the whole of both hemispheres, it is sometimes *also partial:* thus he has seen the *thalamus opticus* of one side of its natural dimensions, whilst that of the opposite side was one fourth larger. This extraordinary developement of the thalamus of one side was not attended with any particular symptom during the patient's life. OTTO refers to a number of cases of hypertrophy confined to a single part of the *brain*, chiefly to the *thalami* and the *corpora quadrigemina*. I am not aware that any well authenticated cases of marked hypertrophy of the *cerebellum* are upon record. The *spinal chord*, however, is not infrequently subjected to this change.

94. Morbid enlargement of the *pineal gland* has been observed by DRELINCOURT, MORGAGNI, LIEUTAUD, DESPORTES, SOEMMERING, ANGELI, GREDING, MECKEL, and BLANE. The *pituitary gland* has also been found enlarged, inflamed, and otherwise changed, by GREDING, BAILLIE, CHAUSSIER, OPPERT, WARD, RULLIER, DE HAEN, RAYER, NEUMANN, ABERCROMBIE, OTTO, the WENZELS, and MECKEL.

95. *C. Imperfect developement and atrophy of the brain*, — *Agenésie cerebrale* (CAZANVIEILH), — is met with in every degree, from a slight diminution of the usual bulk of the whole organ, or of any of its parts, to their almost entire disappearance. Atrophy, although occurring in all situations of the cerebro-spinal axis, is most frequently observed in those which are the last formed: thus the spinal chord is formed before the brain, and atrophy of it is much rarer than that of the encephalon. Of the brain, the convolutions are the last developed, and they are most frequently atrophied. It should, however, be noticed, that the majority of those cases which are denominated atrophy of the brain by ANDRAL, and other French pathologists, are, strictly speaking, imperfect or arrested developement of the organ. The hemispheres are most frequently the seat of atrophy and imperfect developement; and they may be thus affected, either partially, or altogether. Imperfect growth of particular lobes, especially the anterior, is common in idiots, and may exist even although the cranium is well formed, the void being filled up with water, the congenital effusion of which is the probable cause of the arrest of developement. When the hemispheres are par-

tially affected, the lesion is most commonly observed in the convolutions.

96. *a. Atrophy of the convolutions.* — These parts are sometimes only smaller and less numerous than usual, either in respect of one or both hemispheres, or in a portion of a hemisphere merely; and they may be altogether wanting in one, or in both. M. JADELOT lately found the hemispheres of the brain of an idiotic child, aged six years, without convolutions, and consisting of an uniform layer of medullary substance covered by a thin coat of cineritious matter.

97. *b.* Sometimes the *greater part of the hemispheres* of the brain, especially their superior portions, from the vault of the ventricles upwards, are found in a state of atrophy, or altogether wanting. Most of the cases of this description, which have been adduced by the French pathologists, as well as the case of JADELOT, are merely instances of imperfect developement of the part. Sometimes this portion of the encephalon is replaced by a sac containing a serous fluid, having no communication with the ventricles. In other cases, no such body replaces the deficient hemispheres; but the different parts of the anterior and superior aspect of the ventricles, as the thalami optici, corpora striata, &c., may be seen through the membranes, no substance intervening between them and those portions of the floors of the ventricles. These occurrences are, however, not cases of atrophy, but of arrest of the formative process as respects the hemispheres of the brain. Cases of diminished size merely, of one or both hemispheres, are more common than those now instanced; and are generally to be considered as being congenital; or, at least, the result of a diminished nutrition of the part, in the process of the growth of the organs. Instances of extreme smallness, or an entire absence of a part of the hemisphere, are most frequently met with in its posterior or anterior lobes: either of which may be altogether wanting, in one or both sides of the brain. Diminished size of the anterior or posterior lobes are a much more frequent occurrence than their entire absence.

98. *c.* The *thalami optici*, and *corpora striata*, may be also much diminished in volume, either singly or together. The diminution may proceed from a defect either of the grey matter, or of the white substance; and from this cause of diminished bulk, the accompanying symptoms will derive their chief characters. Not only may those bodies be simply diminished in volume, they may be even altogether wanting, either being replaced by a serous cyst, or having no other body as a substitute: in the former case, the hemisphere of that side may be, or not, also entirely wanting; in the latter it is always absent, and, from the cerebral peduncles, nothing more is found than a few scattered fibres, which are spread out into a membranous tissue, resembling that which, at the earliest epochs of fœtal existence, forms the rudiments of the hemispheres. It is evident, that in such cases, the white central portions of the brain being absent, and both sides of the cerebrum being thus circumstanced, there can scarcely be said to be any brain in existence. This, however, does not prevent the other parts contained within the cranium, as the mesocephalon, cerebellum, &c., from being fully formed.

99. *d.* The *central white parts* of the brain may be imperfectly developed, even when no alteration is remarked in the hemispheres. In some such cases the corpus callosum is so small as to form merely a thin membrane. REIL remarked its entire absence in a female idiot, who died at thirty: the two hemispheres communicated only through the medium of the anterior and posterior commissures. It is remarkable, that when the cerebral lobes are wanting, two small masses of nervous substance, whence the olfactory nerves arise, are sometimes found in the anterior part of the cranium; thus displaying in man, in the morbid state, the independent existence of the olfactory lobes, naturally shown in animals.

100. It will be seen from the above, that all the parts of the brain may present a state of imperfect developement to a greater or less extent; that either of them may be entirely wanting, while the others remain; and that all of them may be absent, so that there exists no brain: a circumstance not infrequently observed in fœtuses, and evidently owing to the process of developement having been suddenly arrested.

101. But not only may the brain be in part, or entirely, deficient at birth; it may be also remarkably small at advanced age, particularly in idiots. It may be generally, but more frequently only locally, diminished by external pressure, as in meningeal hydrocephalus. Although the brain, as well as the other parts of the nervous system, wastes so little in general consumption, it is, however, somewhat diminished, although rarely, in the course of certain diseases: SAVARESY states, that he has found it atrophied in yellow fever. HORN remarked a similar state in diabetes; and OTTO, after venereal excesses. Atrophy is, however, more frequently observed in particular parts of the brain. The lateral *lobes of the cerebellum* have been occasionally found atrophied. M. HUTIN observed the medullary centre of the cerebellum reduced one third of its natural size. MORGAGNI, WENZEL, and BIERMAYER have described atrophy of the *corpora striata*. The *optic beds* have been found greatly reduced in size after blindness, by SOEMMERING, MICHAELIS, RUDOLPHI, &c.; and in idiots, by OTTO, RAMSAY, and ROMBERG. The *quadrigeminal bodies, and the tubercles* of the brain, have likewise been severally found atrophied. The pressure occasioned by tumours, collections of lymph, pus, or blood, or even dropsy of the ventricles, may give rise to atrophy, interstitial absorption, or destruction of particular parts of the brain. The want of exercise of the functions of the nervous system may also occasion atrophy, by diminishing nutrition, as an unexercised muscle soon wastes. Thus, the wasting of the brain so generally observed in idiots, may be the effect and not the cause of idiotcy. The *pineal gland*, and the *pituitary gland* or appendage of the brain, have both been seen remarkably atrophied, particularly the latter. According to OTTO, this change has been most frequently remarked in idiots, and in hydrocephalic cases.

102. v. INDURATION, OR HARDENING OF THE BRAIN, — *Sclerencephalia* (CRAIGIE). — The cerebro-spinal axis sometimes presents, either throughout its extent, or in particular parts, a remarkable increase of consistence. This increase varies in *grade*. In its *first degree*, it is nearly of the consistence of a brain which has been kept some

time in dilute nitric acid. The *second degree* of increased hardness resembles the consistence of cheese. In this state, the cerebral substance, when exposed to the action of fire, instead of swelling up, without emitting any marked odour, and leaving a brownish light residue, assumes a horny hardness, emits a strong heavy smell, and leaves a compact blackish residue. Nitrous acid also imparts to it a horny hardness, — circumstances evincing a great increase of the albuminous constituent of the structure. The *third degree* of hardening equals the firmness of wax, frequently also conjoined with elasticity, so that the indurated portion resembles fibro-cartilage.

103. *a.* The *first* grade of induration may affect the whole or the greater part of the cerebro-spinal axis. The two greater degrees of this change are commonly of more or less limited extent. *General hardening* of the brain is usually attended with augmented vascularity, numerous drops of blood becoming effused when the cerebral structure is incised. This increased vascularity, although general, is not constant; for, in some few instances, little or no injection of the capillaries is observed, the brain being rather exsanguineous than vascular. Even in the general induration of the brain, the hardening is not equal throughout every part. It is least remarkable in the cortical structure and convolutions; and more manifest in the white, particularly the central medullary parts, than in the grey substance.

104. *b. Partial induration* of the brain is most frequently found in its central parts, and sometimes in the convolutions. M. ANDRAL has observed it in this latter situation, at as early an age as three years, which is extremely unusual. Sometimes the convolutions of the convexity of the hemispheres are unaltered, whilst those of the base are hardened; occasionally, in such cases, especially when the induration is considerable, the cortical can scarcely be distinguished from the medullary structure. In a case recorded by LALLEMAND, the induration was limited to a circumscribed portion of cortical substance, and, under it, the medullary texture was manifestly softened. M. PINEL found, in one of the hemispheres of a female who had died in a state of idiotcy, a portion of the medullary structure extremely hardened; and, in the same individual, there existed, in the whole posterior and inferior border of the cerebellum, an induration of a fibro-cartilaginous description. The hardened portion was yellowish, elastic, resembling a piece of whitish yellow leather. Mr. PAYEN found, in a girl six years of age, near the posterior third portion of the left hemisphere of the brain, a depression, owing to hardening of one of the convolutions, which seemed externally as if it were shrivelled. It was rose-coloured on its surface, slightly yellowish in its substance, and almost concealed from view by two convolutions, which were healthy. The membranes covering this hardened convolution were white and thickened. Hardening was here joined to diminution of volume; or, perhaps, the disease of this portion of the brain was congenital, and, whilst the growth of the rest of the organ had proceeded, the developement of this was interrupted. The intelligence of this child was well advanced; but she had, from birth, a contraction of the right wrist and foot, with slight atrophy, and incomplete hemiplegia of this side. Similar cases of hardening of portions of the lobes of the brain are described by MONRO, LALLEMAND, and HUTCHINSON. In a case recorded by JOEGER, the induration was limited to the parietes of the posterior cornua of both lateral ventricles, and amounted almost to that of cartilage. BERGMAN found both optic beds hardened in a paralytic and squinting girl: and CASTELLIER and ANDERSON observed excessive hardening of the lobes of the cerebellum. Partial induration of the nervous centres frequently co-exist with other lesions of those organs, especially around old sanguineous effusions and morbid productions formed in the cerebral substance: they are also occasionally found accompanying the usual results of chronic inflammation of the membranes; these being firmly agglutinated together, to an extent of surface more or less considerable, and closely adherent to a subjacent hardened portion of brain. (PORTAL, *Anatomie Méd.* t. iv. p. 91.)

105. *Cause of hardening of the brain.*—The *first* degree of induration has been frequently found in persons who have died of fevers, generally of an ataxic or typhoid type, and in maniacs. M. ANDRAL observed it in two patients afflicted with convulsions from working in lead. MM. GAUDET (*Récherches sur l'Endurcissement gen. de l'Encéph. comme une des Causes des Fièvres Ataxiques.* Paris, 1825.) and BOUILLAUD (*Archives Génér.* t. iii. p. 477.) consider it as the consequence of acute inflammatory action of the brain and its membranes, they having found it in persons who have died of encephalitis occurring either primarily, or as a complication in fevers; and M. ANDRAL (*Anat. Path.* t. ii. p. 810.) seems to coincide with this opinion. RUDOLPHI observed it in thirty cases of typhus: and OTTO found, during the epidemic typhus of 1809 and 1812-13, hardening of the brain frequent in those who died within the first week; and softening in many who died at a later period. But, in these cases, granting the induration to have been the consequence of the disease which destroyed life, it must have taken place in the short space of a very few days; whereas, I am much more inclined to impute it to inflammatory action of a lower grade and of a much slower progress. M. BROUSSAIS regards it as the result of meningo-encephalic inflammation, of a sub-acute or chronic nature. As being generally found in connection with increased vascularity of the substance of the organ, and with this and other signs of inflammatory action of the membranes, the relation of this change to inflammation seems established; but I am inclined to adopt the inference of Dr. CRAIGIE, in respect of the opinions of MM. GAUDET and BOUILLAUD, that, in those cases in which they observed this lesion, it had existed previous to the acute disease which occasioned death.

106. Induration of the brain has been long familiar to pathologists, in relation to mental derangement. The writings of LITTRE, GEOFFROY, BOERHAAVE, LANCISI, MORGAGNI (*Epist. Anat. Méd.* viii. 4—18.), J. F. MECKEL (*Mém. de l'Acad. Roy. de Berlin,* t. vii. p. 306.), LIEUTAUD, SANTORINI, GREDING (*Ludwig's Advers. Med.-Pract.* t. ii. pars 3. p. 533.), PORTAL, MARSHALL (*Morbid Anat. of the Brain, &c.* Lond. 1815.), HASLAM (*Observ. on Madness and Melancholy.* Lond. 1809.), SERRES (*Ann. Médico-*

Chirurg. Paris, 1819.), LALLEMAND (*Récherches Anat. Path.* let. ii.), LERMINIER, BOUILLAUD (*Traité Clinique de l'Encéphalite.* Paris, 1825.), PINEL, jun. (*Rév. Méd.* t. vi.), FOVILLE, and PINEL-GRANDCHAMP, furnish numerous instances of it, thus related: and, from the history of the cases, as well as the generally augmented vascularity of the membranes and of the indurated brain itself, I infer that it is a consequence of chronic inflammatory action, conjoined with some change in the nutrition of the cerebral substance; and that it proceeds from a less intense and more chronic state of the vascular action than that which occasions softening, or pulpy destruction of the cerebral texture. That such is the case, is proved, not only by my own experience, but also by the observations of the authors enumerated above; for, in the majority of those cases, even when presenting the appearances and consequences of cephalo-meningeal congestion and inflammation, the symptoms of cerebral disease were of much longer duration, than those depending upon morbid softening of the organ.

107. It has already been stated, that induration of the cerebral substances, amounting to either the *second* or the *third* degree, is generally circumscribed in extent. Whatever doubts may be entertained of the *first* degree of hardening being the result of chronic rather than of acute disease, there can be no doubt of the second and third being always a chronic affection — perhaps, of a still more chronic state of capillary action than that giving rise to the first form of increased hardness; the morbid action, affecting in the former cases a portion of the brain only, may be compatible with a longer duration of life, and hence give rise to ulterior or more advanced stages of change than those presented when the whole organ is affected, and all its functions and energies thereby involved. That this change is one of the consequences of chronic irritation, or inflammatory action, may be conceded, as well as the supposition entertained by ANDRAL and CRAIGIE, that the morbid irritation is connected with a perversion of the nutritive action. Indeed, the numerous cases detailed by PORTAL, SERRES, LALLEMAND, BOUILLAUD, PINEL, and others, furnish satisfactory evidence, both in the symptoms during life, and in the co-existent lesions in the membranes and other parts of the brain, of the existence of a chronic inflammatory action, or of a state of irritative erythism of its capillaries. But to say that this state is in such cases accompanied by a perversion of its nutritive actions, is ascribing to it what always is an attendant upon inflammatory action, of whatever grade, or in whatever texture it may be seated. It should, however, be mentioned, that M. LALLEMAND considers partial induration to occur occasionally as a favourable termination of morbid softening of the brain; but this is a mere supposition.

108. As to the *phenomena* to which induration of the brain gives rise, every practical man must feel considerable interest. The *first* and more *general induration* of the brain generally occasions loss of memory, confusion of thought, and derangement of the mental manifestations — causing insanity without lucid intervals. When the induration is advanced in degree, or considerable as to its extent, or both, and especially when its long duration has been indicated by continued mental derangement, a complete obliteration of the mental faculties, or fatuity, is frequently its attendant towards the last periods of life, and may therefore be considered as the consequence of the most advanced degrees of this lesion. The signs of *partial induration* of the brain, in any of the grades to which I have referred, will vary according to the extent and seat of the lesion. They consist chiefly of a progressive defect of memory, inattention, or an inability to pursue a long train of ideas, indifference to momentary impressions, and to present or future occurrences, difficulty of articulation, derangement of ideas, with partial or total loss of the affections, appetites, and desires; and ultimately increased loss of speech, palsy, convulsions, or want of power over the muscles, fatuity, general or partial wasting, and death.

109. LALLEMAND found, in a patient who had complained of fixed pain of the forehead, palsy of the face, and confusion of memory; the membranes firmly matted together, for the extent of a thirty sous piece, at the anterior extremity of the left hemisphere; the subjacent cerebral substance hardened to a scirrhous or cartilaginous firmness, and adhering closely to the membranes. BOUILLAUD states, that of a man, aged sixty-eight, who, after symptoms of cerebral disease, had impaired memory, headach, difficulty of expressing his ideas, followed by muscular weakness and convulsions. The cerebral substance was found injected, and induration was seen " passing from the striated body of the left hemisphere, through the nucleus, at the upper region of which it formed a cavity with hard yellow walls; a similar hardened portion also existed in the posterior lobe. According to M. PINEL, induration confined to the brain causes fatuity, with more or less of palsy; but, if it extend to the annular protuberance, the crura cerebri, the corpora olivaria, or chord itself, epilepsy, followed by palsy, and death by marasmus, are generally superadded. In these advanced degrees of hardening, which are sometimes attended with a shrunk, depressed, and condensed appearance, — a species of atrophic hardening of the part, — there are usually remarked palsy and idiotcy, which are either congenital, or occurring subsequently to birth.

110. vi. MORBID GROWTHS. — *Tumours of the brain.* Tumours of various kinds have been found to originate in the substance of the brain; but as Dr. CRAIGIE (*Anat.* p. 447.) has observed, they have not been distinguished with sufficient precision by authors, from those which, originating in the membranes, affect the brain only secondarily. The *first* form of tumour which he has described, and denominated "*cerebral tumour,*" entirely agrees with those partial indurations already considered; differing from them in no respect, but in the extreme degree of firmness it presents, which is similar to the second and third (the latter particularly) degrees of hardening, arising in the manner I have endeavoured to explain (§ 104.), and affecting all parts of the nervous masses, — the cerebellum and medullary chord, as well as the various parts of the brain itself. (See HARDENING, &c.)

111. *A. Tubercular secretion,* — *Tyroma* (CRAIGIE). — Tubercles of the brain have been described in recent times with much accuracy by GENDRIN, LÉVEILLÉ, OLLIVIER, ABERCROMBIE,

ANDRAL, and CRAIGIE. They are formed of a white, or pale yellow, opaque, firm, cheese-like, sometimes granular and friable substance, consisting of a large proportion of albuminous matter, and varying in size, from that of a millet seed to the bulk of a hen's egg. This substance is deposited in various forms in the brain, but usually as follows: — 1st, One, two, or more, homogeneous, distinct masses, of considerable size; 2d, Several, or many, separate, minute, spherical, or spheroidal masses. Cases of the *first* form of tubercular formations are to be found in the writings of MANGET, ROCHOUX (*Récherches sur l'Apoplexie*, p. 151.), POWELL (*Trans. of Coll. of Phys.* vol. v. p. 222.), BLANE (*Trans. of a Society, &c.* vol. ii.), BAILLIE (*Fasc. of Eng.* No. 10. plate vii.), COINDET (*Mém. sur l'Hydroceph.* p. 106.), BOUILLAUD (*Traité, &c.* p. 161.), ABERCROMBIE, (*Dis. of the Brain, &c.* p. 428.); CHAMBERS (*Med. and Phys. Journ.* vol. lv. 1826, p. 5.), PIEDAGNEL (*Journ. de Phys.* t. iii. p. 247.), BERARD (*Ibid.* t. v. p. 17.), and HOOPER (*Morbid Anat. of the Brain*, p. xi. and xii. fig. 1.). Tubercles of this class vary in number from one to five or six, and in size from that of a pea to the bulk of a hen's egg. In form they closely resemble tubercles in other parts of the body. According to LÉVEILLÉ, they are often of an unequal surface, so as to appear lobulated, particularly when they are very large. If only one or two are present, their size is generally considerable. M. ANDRAL mentions their existence in the cerebellum, of so large a volume as to destroy nearly the whole of one of its hemispheres. Even when of this bulk, they consist of the opaque, cheese-like substance already described, and are always destitute of vessels, or any trace of organic structure. They are albuminous, friable, and generally surrounded by a cyst. MM. GENDRIN and LÉVEILLÉ are of opinion that they always have cysts, but of variable thickness, which are sometimes remarkably thin, at other times, especially in old tubercles, thick and fibrous. The cyst adheres externally to the surrounding cerebral structure; and its internal surface sends off delicate filaments, which traverse the continued tubercular matter, and, in the large and old tubercles with thick cysts, seem like small fibres or partitions passing between the lobules of the contained substance, which is disposed in cellules formed by these filaments. In some large and old tubercles, the cyst is fibrous, cartilaginous, or even osseous (GENDRIN), and is sometimes partially separated from the surrounding cerebral structure by a minute quantity of serous fluid. In proportion as the tubercle softens, the cyst becomes more apparent.

112. The surrounding cerebral substance is often perfectly natural, and sometimes variously altered; — occasionally inflamed, or softened, or atrophied, or even destroyed, especially when the tubercles are very large. Upon these lesions, the symptoms during life are often chiefly dependent. Very frequently, especially in children, tubercles varying as to number and size may exist in the brain, without occasioning any symptoms sufficient to lead to the suspicion of cerebral disease: but this seems to be the case only when the nervous substance around them has been but little changed from the healthy state. When nervous symptoms have appeared without such change, they have generally assumed an intermittent character.

113. It is very probable that tubercles are formed in the brain, as elsewhere, at first in a fluid state; and that they afterwards either undergo a slow coagulation, or have their aqueous portions partly absorbed, the albuminous and other more solid constituents forming the tubercular substance. M. BOUILLAUD believes that they are the product of an inflammatory process; and the tendency of inflammation to produce an albuminous secretion certainly countenances this opinion. Whatever may be the origin, they appear to experience in the brain a similar softening to that which they undergo when formed in other organs. When this is advanced to more or less partial fluidity, tubercles may be mistaken for other formations; and when amounting to liquefaction, the tubercular production can, with difficulty, be distinguished from a small encysted abscess. (See art. TUBERCLES.)

114. The *second* form in which tubercular productions are found in the brain, is that of spheroidal bodies, disseminated through its substance. Professor REIL (*Memorab. Clinica*, t. ii. fas. iii. No. 2. p. 39.) describes them, in a case which occurred to him, to have consisted of about two hundred spheroidal bodies lodged in the grey matter of the brain and cerebellum. They were a little firmer than the brain itself, mostly of a pale yellow, some of a pale blue, of the size of a lentil or pea, and consisting of an adipose-like substance. From some, which were marked in the centre with a dark point, and seemed covered by a thin cyst, a slight incision discharged a matter like vermicelli. These bodies were confined entirely to the cortical substance of the brain, chiefly near the deep anfractuosities, and but very few were in the prominent parts of the convolutions. They were most numerous in the superior aspect of the hemispheres, less so in the cerebellum, and least numerous in the base of the cerebrum. The pia mater was remarkably injected with blood, and the ventricles contained very much fluid. This patient had never complained of pain in his head, although long afflicted with scrofulous sores, until eight days previous to death. In a case recorded by M. CHOMEL (*Nouv. Journ. de Méd.* t. i. p. 191.), similar bodies were found disseminated through the brain of a woman aged thirty, who died with symptoms of cerebral disease. Two such productions were also found in the cerebellum, and one in the spinal chord. Cases similar to the above have likewise been recorded by other writers. Tubercles, even in the form now being considered, are seldom or ever found in greater number than in the case just quoted from REIL; and, as GENDRIN has remarked, they are never found in the brain in so very great numbers as in the lungs; nor, in my opinion, do they assume, in the cerebral structure, the agglomerated form, in which they are so often met with in other viscera, and in the lungs especially.

115. Tubercles are often met with in the brains of children, and those especially of a strumous diathesis, and upwards of one or two years of age. They occur most frequently from this age to puberty; after which they are rarely met with, even in scrofulous and phthisical subjects, where tubercles exist not only in the lungs, but

also in other organs. They are most common in the hemispheres of the brain, and there occupy indifferently either the cortical or the medullary texture: sometimes they appear, as it were, placed between both. In some cases in which they have been found in the more exterior layer of the cineritious structure, they seem not to have been originally formed in it, but to have sprung from the internal surface of the pia mater, and to have pressed inwards the cerebral tissue as they increased in size, forming, as it were, a superficial cavity in it, without any intimate union with it beyond that of close contact. The parts of the brain, after the hemispheres, where tubercles are most commonly found, are, according to M. ANDRAL, the cerebellum, the mesocephalon, the medulla oblongata, various parts of the spinal chord, the peduncles of the cerebrum and cerebellum, the thalami optici, corpora striata, the commissures of the thalami, and pituitary body. According to the order of frequency here indicated, it will be observed, that those parts of the cerebro-spinal axis which are most frequently the seats of inflammation, softening, or hæmorrhage, are not those which are oftenest the seat of tubercles.

116. *B. Adipose tumour* (WENZEL),—*Fatty productions* (ANDRAL), — *Lardaceous degeneration* (HEBREART, *Annuaire Méd. Chirurg.* Paris, 1829. p. 579.), — *Ceroma* (CRAIGIE). — This morbid formation has been noticed, under the above designations, by the authors whose names are respectively noticed, and also by RUDOLPHI, BRAUN, CRUVEILHIER, MERAT, LEPRESTRE (*Archives Génér. de Méd.* t. xviii. p. 19.), and DALMAS (*Journ. Hebdom. de Méd.* t. i. p. 332.). BORELLI states that he has found, behind the upper part of the medulla oblongata, a fatty, homogeneous, reddish, or rose-coloured substance, the size of a nut, apparently traversed by reddish lines, and contained within a thin envelope. A similar tumour, though smaller, was found in the left cerebellic hemisphere. Amongst the great number of brains examined by the WENZELS, only two presented this change; which they describe as having been smooth, of a yellow colour, and consisting of a solid, adipose, ash-coloured substance; and, although found near the exterior surface of the hemisphere, penetrating deep into the substance of the organ.

117. According to M. HEBREART, this disease is not so rare as the WENZELS lead us to suppose. He had met with four cases of it; two in which the tumour was seated in the brain, and two in the cerebellum. "In the first of the former, a distinct tumour, consisting of matter of a yellow colour, and lard-like consistence, the size of a nut, in the anterior part of the anterior lobe of the right hemisphere, gave rise to idiotcy. In the second, a square inch of the posterior lobe of the left hemisphere was converted into a yellowish pulpy matter, which was separated from the contiguous sound brain by hardened cerebral substance. This, in a man aged forty, caused epileptic paroxysms, occurring once or twice a month, which at last proved fatal, by causing asphyxia. In the first of the cerebellic cases, in a young man who had been idiotic for six years, the cerebral substance, forming the walls of the fourth ventricle, had been converted into a yellowish lardaceous matter In the second, that of an incurable maniac, a space, six lines in diameter, of the lower part of the right hemisphere of the cerebellum, had become hard, yellowish, and lardaceous, both in the grey substance, and also in the white." The membranes also participated in this change. M. HEBREART considers that this lesion may occur in two forms,—1st, As a degeneration of the cerebral structure into a matter of a yellowish colour and lardaceous consistence; and, 2d, In the shape of a distinct tumour situated in the cerebral substance.

118. Closely allied to the above, although materially different in some respects, yet still more strictly deserving the term adipose, are the tumours described by LEPRESTRE and DALMAS. M. LEPRESTRE found, in the left side of the mesocephalon of an adult subject, a large tumour, with a brilliant lobulated surface, consisting of concentric layers, united by means of fine cellular tissue, but without any trace of blood-vessels. It was denser in its structure than the brain, and closely resembled a mass of adipocire. This resemblance is remarkable, inasmuch as MM. BARRUEL and GMELIN have demonstrated, in the healthy human brain, a certain quantity of fatty matter and cholesterine. The tumour found by M. DALMAS nearly resembled the foregoing. It was situated in the base of the brain, and was as large as a hen's egg. It rose upwards into the third ventricle, separated the parts which contribute to the formation of this cavity, and disappeared in the medullary substance of the striated bodies, the thalami optici, the anterior commissure, &c. Its superior surface closely resembled spermaceti. Its inferior surface was transparent, polished, and studded with a number of pearl-like granulations, from a line to a line and a half in diameter, which were, like the whole of the mass, perfectly homogeneous, and devoid of every trace of organisation. When analysed by M. BARRUEL, this tumour was found to contain a very large portion of fatty matter, and a substance which seemed to be cholesterine. The description of a similar tumour is recorded in the first volume of the *Journal Clinique des Hôpitaux.* OTTO also found a fatty tumour, which contained hair, protruding through an aperture in the hemisphere into the ventricle, its cyst shining like mother-of-pearl.

119. *C. Flesh-like tumour,* — *Adenoidea* (CRAIGIE).—This production has been described by the vague names of scirrhous and scrofulous tumour; but it cannot be admitted to possess unequivocal characters of either. It is generally stated to be similar to a mass of flesh, or an enlarged absorbent gland. Its colour is light pink, or pale flesh-colour; its firmness is considerable; and, in some instances, it is compared to the kidney. Cases of this description of lesion may be found in the writings of PLATER (*Obser.* l. i. p. 13.), T. BONET (*Sepulchetum*, t. i. p. 283.), RHODIUS (*Cent. Obs. I.* No. 55.), J. J. WAGNER (*Miscell. Curios. Dec. II. Ann.* 10.), J. G. ZINN (*Comment. Soc. Reg. Scient. Gott.* t. ii. 1752.), J. J. HUBER (*Nova Acta Physico-Medico Acad. Cæs. Leop. Cur.* t. iii. p. 533.; *et Comment. de Rebus in Scient. Nat.* t. xviii. p. 335.), HALLER (*Opusc. Path.* Obs. i.), J. E. GREDING (*Ludwig's Advers. Med. Prac.* t. ii. part ii. p. 492.), H. EARLE (*Med. Chirurg. Trans.* vol. iii. p. 59.), POWELL (*Trans. of Coll. of Phys.* vol. v. p. 241.), &c. Most

of those cases appear to have occurred in strumous habits; and, besides signs of glandular disease, many of them were affected with palsy, apoplexy, or mental derangement; and others with convulsions and epilepsy, shortly before death. M. Andral (*Anat. Patholog.* t. ii. p. 848.) mentions his having found, in the middle of one of the hemispheres of the brain of a person who had died of apoplexy, a fleshy fibrous tumour of the size of a walnut.

120. *D. Fibro-cartilaginous tumour,—Scirrhus, Chondroma* (Hooper and Craigie),—is probably, in its slighter grades of change, merely an advanced state of the third variety of partial induration of the brain (§ 103.). It is distinguished from the surrounding cerebral substance by its great firmness; its irregular and lobulated form; its yellowish, hard, and fibrous structure; and, in its advanced stages, by the presence of a semi-fluid, gelatinous matter, occasionally tinged with blood, contained in small cavities, disseminated through it; and by a tendency to softening; death, however, generally taking place before complete softening, or cancerous ulceration, has supervened. This tumour is not often met with in the substance of the brain, and very seldom as a primary affection. It seems to consist of a change in the structure of the part affected, rather than of a deposition of adventitious matter; and it is not enveloped by any cyst; but gradually disappears in the surrounding substance, which is sometimes softened. All the cases which have been recorded of scirrhus of the brain, are not in every respect similar to the above description, but an approximation to it merely; some, according to the loose accounts given of them, being intermediate between this and the cartilaginous conditions. The best illustrations of this form of tumour have been furnished by Cruveilhier (*Anat. Pathol.* t. ii. p. 80.), Rostan (*Récherches sur le Ramollissement du Cerveau, &c.* 1re ed. p. 80.), Andral (*Journ. de Physiol.* t. ii. p. 105.), Bouillaud (*Traité Clinique de l'Encéphalite, &c.* 1825.), Lerminier (*Ann. Méd.-Chirurg.* 1819, p. 225.), Monro (*Morb. Anat. of the Brain*, p. 55.), Wade (*Medic. and Phys. Journ.* vol. lv. p. 369.), Bayle (*Réch. sur la Phthisie Pulmon. &c.* p. 305.), and Copland Hutchison (*Trans. of Med. and Chir. Soc.* vol. ii. and iv.). All these cases were characterised by acute pain in the head, stupor, palsy, idiotcy, convulsive movements, and, at last, insensibility, coma, or complete apoplexy, and death; or by one or more of these symptoms; and several of them seemed to originate in external injury received at a more or less remote period.

121. *E. Bony tumours and calcareous concretions, — Osteoma* (Hooper),—are rarely observed in the substance of the brain. Cases have, however, been furnished of their formation, in more or less considerable masses, — near the right ventricle, in an idiot, by Kerkringius (*Obs. Anat.* p. 135.); in the corpus striatum, by Deidier (*Des Tumeurs, &c.* p. 351.), and Kentmann (*De Calc. in Hominib.* Tig. 1536.); in one of the corpora quadrigemina, by Tyson (*Phil. Trans.* No. 228.); in the union of the optic nerves, by Blegny (*Zodiac. Gall.* Obs. xiv. p. 81.); where they were attended by violent pain in the occiput, by Boyer (*Cruveilhier's Anat. Path.* t. ii. p. 84.); in the cerebellum, by Littre (*Mém. de l'Acad. de Paris*, 1705, p. 55.); in the cerebellum of an epileptic, by Lieutaud (*Hist. Anat. Méd.* l. iii. Obs. 179.); in the pons varolii, by Metzger (*Obs. Anat. Reg.* 1792, p. 3.); in the optic beds, by Caldani (*Opusc. Anat. Path.* 1803, p. 51.); in one hemisphere of an epileptic, by Otto (*Comp. Anat. Path.* p. 415.); in the cerebellic peduncles and protuberance of an idiot, by Home (*Phil. Trans.* 1814.); in the left hemisphere, by Andral (*Journ. de Physiol.* t. ii. p. 110.); in the cerebellum, with violent pain at a determinate part of the occiput, by Nasse (*Abercrombie on Dis. of the Brain*, p. 426.); in the centre of the medullary substance of the anterior lobe, with pulpy destruction of the surrounding part in one case, and in the cerebellum in another, by Dr. Hooper (*Morb. Anat. of the Brain*, p. 39.). Besides these, other instances are referred to in the *Repertorium* of Ploucquet, and the *Compendium* of Otto. In more numerous cases, the chalky, calcareous, or bony matter, is disseminated like sand in a diseased portion of brain, and can be detected only by squeezing or rubbing the part between the fingers. In some cases, the bony matter appears like minute spiculæ, or particles; and Dr. Hooper states that he has found each of them attached to a filamentous vessel.

122. Sabulous concretions are so constantly found in the *pineal gland*, or its peduncles, even of those whose cerebral functions were most healthy, that Soemmering conceived them to form a part of its natural structure in adults. But this part may be greatly enlarged, and contain calcareous matter to an excessive amount. A case of this description is given by Manget (*Theat. Anat.* l. iv. c. ii. p. 309.) and Salzmann (*De Gland. Pineal. Lapid.* Arg. 1733.).

123. *F. Hygromatous tumours, or cysts, containing a serous or albuminous fluid, — Hygroma* of Hooper), — are not infrequently found in some part or other of the brain. Dr. Hooper has described four varieties of these cysts: — *a.* That consisting of a *simple cell*, or *cavity*, containing a transparent, yellowish, or yellowish red, serous fluid. Their sides are somewhat harder than healthy brain, occasionally rough, and of a brownish hue internally, but mostly smooth and shining. They present no appearance of membrane lining the cell, nor of vascularity; are of the size of peas or nuts, and are most frequently met with near the external surface of the brain. They appear to be the remains of cavities formed by extravasated blood. *b.* Another variety is a distinctly *encysted tumour*, consisting of a membranous cyst, or vesicle, filled with a serous fluid. This cyst is delicate, is formed of a single membrane, and is provided with vessels coming from the surrounding brain, and which may sometimes be seen ramified over it. The fluid which fills it is colourless and limpid. This variety varies from a very small size to that of a small orange. It is sometimes solitary; but occasionally two or more may be embedded close together. *c.* Dr. Hooper describes *two other varieties*, one of which is formed of a cyst, which is opaque in some parts, and transparent in others, and distended with a sero-albuminous fluid. The cyst is not apparently vascular, but is much thicker than the preceding; and its contents coagulate by heat: *d.* The other is characterised by the remarkable thickness of its cyst, and the thick albuminous nature of its contents. It is generally found

embedded in the medullary substance of the brain.

124. *G. Hydatids.*—The existence of *true hydatids,* —both the *acephalocyst,* or headless hydatid, and the *cysticercus,* or bladder-tailed hydatid,—in the substance of the brain, has been doubted. Several cases of hydatids in this part have been adduced by authors; and instances have occurred to Andral and Calmeil (*Anat. Pathol.* t. ii. p. 779.), which they considered to belong to the latter of the above species of entozoa; but whether they actually were such, or some one of the cysts described above, rests upon the pathological reputation of these physicians. Those adduced by Home, Headington, Morrah, and Rostan, seem to have been merely varieties of *hygroma.* Dr. Hooper never met with hydatids in this situation, in his numerous dissections. Brera states that he has found them in the choroid plexus; and Dr. Monro relates a case, where a cyst, which he considered as a true hydatid, was found in one of the ventricles. But their connection with the membranes of the brain (§ 31.) has already been shown.

125. *H.* The *Hæmatomatous tumour,—the Hæmatoma* of Hooper,—is not common. It is mostly fungous, arising from a small base, separating the convolutions and cerebral substance about it, as it enlarges and rises towards the surface of the brain. It is soft to the touch; is elastic, and covered with a vascular and shaggy membranous tissue. When divided, its inner structure is vascular, mottled, of a whity brown, and, in some parts, of a bloody colour; and a humid substance adheres to the knife like cream. Interesting cases have been detailed by Rochoux (*Réch. sur l'Apoplexie,* Ob. 38. p. 149.), Hooper (*Op. Cit.* pl. x.), Monro (*Op. Cit.* p. 56.), and G. Gregory (*Med. and Phys. Journ.* vol. liv. p. 462.), in which these tumours were, exteriorly, of a reddish or reddish brown colour, lobulated, and surrounded by pulpy destruction of the cerebral substance. In two of the patients, violent headach and epilepsy, and, in one, palsy, followed by coma, preceded dissolution. This tumour must not be confounded with the solid nodules of extravasated blood, often found after apoplectic seizures.

126. *I. Encephaloid or cerebriform tumours,—Medullary sarcom,—Fungus hæmatoides,—Cephaloma,* Hooper.—These tumours are not frequent. Delineations of them have been given in Dr. Baillie's and Dr. Hooper's illustrations. They occur chiefly in young subjects; and are encysted, soft, compressible, and spongy, resembling the grey cerebral substance, with a tinge of red, and of the consistence of the fœtal brain. They are frequently divided into lobulated masses. When cut with a knife, the surface is smooth, and the knife is covered with an unctuous substance. I have met with one case in a boy of eleven years of age. M. Bayle found it in the cerebellum of a middle-aged man. (*Rév. Méd.* Avr. 1824, p.77.)

127. *K. The Melanoid tumour,—Melanosis,—Melanoma,* of Hooper.—Melanosis has rarely been found in the brain. Dr. Hooper has, however, observed it in a tuberculous form, both in the cineritious and medullary structure. These tumours were of a jet black colour, soft, distinctly circumscribed, and closely surrounded by healthy brain. Dr. H. has found them of all sizes, from that of a mustard seed to that of a walnut. "They are so soft as to require a very sharp knife to cut them, which they soil. They are easily taken out of the brain with a forceps, and leave a clean cavity, without any cyst apparent to the naked eye; and if shaken in water, they colour it black, and a flocculent substance remains. In one instance, in which there were several of these tumours, some of them were of a blood or liver colour, and resembled hæmatoma (§ 125.); others were perfectly melanomatous; and several were of an intermediate colour,—a circumstance which is very much in favour of the hæmatoma and melanoma having an intimate connection, if they be not one and the same disease, modified by particular circumstances." (p. 41.)

128. All the tumours now described occasion alterations, generally of an inflammatory nature, with softening in the substance of the brain contiguous to them; and until those alterations have been in some measure produced, they often give rise to but little disturbance of the functions of the organ. However, when these changes become developed, the usual symptoms of *circumscribed inflammation of the substance of the brain,* with softening; *epilepsy;* loss, or perversion of one or more of the mental faculties—amounting often to *insanity; idiotcy; palsy; coma,* and *apoplexy;* are the usual effects. (See *the Articles on these diseases.*)

129. vii. Rupture of the Brain.—*Hernia cerebri,—Encephalocele,*—is occasionally met with. It consists of the protrusion externally of a portion of the brain through openings in the cranial bones. This lesion either may be *congenital,* or may arise *subsequently* to birth. In the *former* case it is generally connected with effusion of fluid in the ventricles. The protrusion of brain varies with the size of the aperture in the skull, and the quantity of effusion causing it. In some cases a large portion of the skull is wanting, and the protruding part of the brain has a wide base: in other cases, the opening in the cranium is small, and the protrusion is either very small, or attached to a narrow neck. Otto states, that in every case which he has observed, the lesion was owing to effusion, and not to hypertrophy of the substance of the brain; and that the aperture arising from deficient developement of the bones of the cranium was one of the consequences of the effusion. This agrees with my experience, and constitutes *hydrencephalocele* or watery rupture of the brain. In some cases large portions of the brain are protruded, in others but small. Frequently the protrusion consists only of the membranes forming *hydrencephalocele meningea,* and the water which they contain. Otto describes this as a rare occurrence. I have met with several cases at the Infirmary for Children, and in unusual situations, namely, through clefts in the parietal bones. In rare cases of hernia cerebri, the water is found both within the ventricles and between the membranes.

130. Congenital rupture of the brain occurs most frequently on the back of the head, through the enlarged occipital foramen, and the cleft upper cervical vertebra, or through a cleft in the upper part of the occipital bone, or in the lambdoidal suture. It is not frequent at the top of the head, especially at the great fontanel; and Otto says it is still more rare in the sides of the skull and

forehead, and the rarest of all in the orbits and sphenoidal sinuses. Two cases, however, of its occurrence at the sides of the skull have come before me. Rupture of the brain, occurring *after birth*, arises from the expansion of the brain by its own elasticity, or by increased determinations of blood, and its consequent detrusion through apertures naturally or artificially made in the cranium. I have met with cases, however, in which no protrusion of the brain had been observed after birth; and yet apertures, through which it might have occurred, were found in the middle or squamous parts of the bones, and must have been congenital. The inference is, in these cases, that a watery tumour of the brain had arrested the formation of the bone immediately over it, and that this tumour had subsequently disappeared, probably from the absorption of the aqueous effusion; but that the bone had not yet been formed in the situation where the ossific process had been interrupted.

131. viii. LACERATION. — The *continuity* of the brain may be destroyed by external violence, or injuries penetrating the cranium, either with or without loss of substance. Concussions also will *lacerate* the brain, without the skull being penetrated or even fractured. The substance of the organ, particularly the septum and fornix, may be torn by large collections of water in the ventricles. There is every reason to suppose that, when the solution of continuity is simple, adhesions will take place. When there is loss of substance, the injury can be repaired only by granulation. If the *laceration* be accompanied with the effusion of blood, so as to form a large coagulum, requiring to be absorbed, the reunion of the opposite sides of the lacerated brain is effected by means of a fine cellular tissue; permanent paralysis being the usual consequence. When the granulations of the lacerated brain protrude through the fractured skull, owing to their luxuriance, or rather to the elasticity of the brain; and when the protrusion proceeds from the distension arising from the fulness of its vessels, the morbid condition has been improperly called *fungus cerebri*, — improperly, inasmuch as the term *fungus* is applied to a malignant and constitutional malady.

132. ix. ECCHYMOSES, AND ALTERATIONS OF COLOUR. — Besides the lesions now described, there are *others of a less remarkable kind*, of which a brief notice may be taken. *a*. The *cineritious substance* may be extremely *pale*, and even approximating to *white;* and it may also be of a very *deep colour*, and almost approaching to *black*, particularly in some cases of asphyxia and fevers, owing probably to the dark and imperfectly decarbonised state of the blood. The different layers composing this substance are sometimes also more than usually distinct, and separate easily from each other (M. FOVILLE and Dr. BRIGHT). In other cases they are very thin, as if in a great measure absorbed. This part of the cerebral substance likewise, in some instances, presents numerous *ecchymosed spots* of various sizes and depth of colour. *b*. The *medullary structure* is also sometimes *ecchymosed*, particularly after concussion; and variously *marbled*, and presenting blotches of a pink, purplish, greyish, or of a greyish yellow. These changes seem to proceed from excessive injection of the minute capillaries of the organs, and probably from partial extravasation of their contents, owing to over-distension, or a morbid state of the blood which had circulated in them shortly before death, and are most commonly observed after death from convulsions and malignant diseases.

133. As respects the *colour* of the brain generally, I may state that it is sometimes found unusually pale from deficiency of blood, in cases of anæmia and cachexia. But it is more commonly of a *deep* or *pink colour*, particularly in those who have died from apoplexy, strangulation, narcotic poisons, asphyxia; and in the insane, or those given to drunkenness. In some cases resulting from those diseases, or attended with cerebral congestion, dark red, *bluish*, or *purple coloured* spots, or even streaks, have been found in both the cortical and medullary structure. In cases of inflammatory irritation, a reddish or pink hue is observed. A *red* colour is rarely met with, but more commonly a *pale rose tint*, unless effusion of blood have occurred. I may also state, at this place, that if, in severe diseases of the brain, the blood be decomposed, or if the colouring particles be secreted in various proportions, the brain will present different shades of colour, both in its cineritious and in its medullary substance: it will thus be either a pale or dusky yellow, an orange, a brown, greyish green, a slate colour, and even here and there soot-coloured. Occasionally, also, in different changes of texture, although even without these, a deposition of a *melanotic* pigment takes place, chiefly in the course of the larger vessels, independently of the melanoid tumour (§ 127.). OTTO never observed the brain generally tinged yellow in cases of jaundice, and doubts it having ever occurred, although STOLL says that he has seen it. I should add, that the above changes of colour are independent of marked softening or pulpy destruction of the cerebral substance.

BRAIN. — ANÆMIA OF THE. — See § 132., and art. CONVULSIONS.

BRAIN. — CEREBRAL PLETHORA. — *Determination of Blood to the Head.* CLASSIF. II. CLASS, I. ORDER (*Author*).

134. When the blood is determined in too great quantity to the brain, although the patient may not be altogether incapable of his usual avocations, yet much disorder may be present, which, if neglected, may lead to serious diseases, more especially to those which will be considered in the sequel of this article.

135. *Causes.* — The causes of general vascular plethora likewise occasion this affection. Those which are more peculiar to it, are inactivity of the secreting and excreting functions, mental exertion, retention of accustomed evacuations and discharges, full living, sedentary occupations, and want of exercise in the open air; organic diseases of the heart, particularly hypertrophy of the left ventricle, and those causes which are enumerated under the article APOPLEXY.

136. *Symptoms.* — Cerebral plethora, and determination of blood to the head, differ in many respects from cerebral congestion, or *coup de sang* (§ 139.), but the symptoms accompanying them vary chiefly in degree. Where the disorder consists merely of plethora from local determination, somnolency, cephalalgia attended with scintillations, and objects appearing of a red colour, vertigo, noises in the ears, sometimes sleeplessness, moral and

physical excitation, intellectual activity; or, on the contrary, inactivity, inability of continued attention, stiffness, cramps, twitchings, &c. of the limbs; animation of the countenance and eyes, which are sometimes red or injected, with strong pulsation of the carotid and temporal arteries, full and somewhat frequent pulse, and slightly increased temperature about the head, are the usual symptoms.

137. *Morbid appearances.*—This state of disorder never of itself occasions death; but, as it sometimes occurs in the advanced stages of fatal diseases, it has been observed to consist of increased vascularity in the brain and its membranes, without further organic change; but it is sometimes accompanied with a slight serous effusion into the ventricles and between the membranes, particularly towards the base of the brain. This effusion seldom amounts to more than may be present in the healthy state of the organ, the excess being probably rather a consequence of death, than its antecedent.

138. *Treatment.*— Cerebral plethora may generally be removed by avoiding the causes inducing it; by promoting the abdominal secretions and excretions by the usual means; by the affusion of cold water on the head, and the daily use of the shower-bath, or by sponging the head with cold lotions; by clothing the lower extremities warmly, and promoting the cutaneous perspiration; by regular daily exercise; by due attention to the quantity and quality of the food; and by changes of air in obstinate cases, and sea voyages.

Brain. — Congestion of Blood in the. — *Coup de Sang.* — *Cerebral Congestion.* Classif. II. Class, I. Order (*Author*).

139. Congestion is an advanced as well as a modified state of cerebral plethora, and consists in too great an accumulation of blood in the vessels of the head, particularly in the venous capillaries and sinuses, occasioned either by too great a flux of this fluid to the brain, an exhausted tone of the capillaries and smaller vessels, or impeded return of it by the veins. This state of circulation in so important an organ as this is, necessarily occasions marked lesion, not only of the functions which it performs, but also of other functions throughout the system.

140. *Symptoms.*— Cerebral congestion is characterised by numbness, vertigo, noises in the ears, somnolency, brilliancy or watering of the eyes, cephalalgia, redness of the countenance, beating of the carotids and temporal arteries, loss of recollection, &c. These symptoms continue for some time in different degrees, sometimes disappearing, and after a while returning, accompanied with cramps, twitchings of the limbs, generally of both sides: at last the patient loses sense and voluntary motion, in a more or less sudden manner. But usually in the course of a few minutes, or, at furthest, some hours, the more urgent of these symptoms disappear; leaving, however, numbness of the limbs, which generally disappears in a short time, or in the course of one or two days.

141. In the more severe cases, and those which more nearly approach complete apoplexy, the attack is preceded by disorder of the stomach, or accompanied by nausea, or vomitings; and sometimes, during the loss of sense and voluntary motion, the stools and urine are voided involuntarily; respiration is more or less embarrassed, but not stertorous; the pulse is strong, frequent, and full; the temporal and carotid arteries beat strongly; and the skin is generally warm and natural. Cerebral congestion is almost always general throughout the brain, but it is also, although rarely, local, affecting only one hemisphere; and, owing to the numbness and temporary paralysis thereby occasioned, is confined either to one limb or to one side of the body; simulating apoplexy, or paralysis from hæmorrhage in the brain. That these local symptoms are, however, owing to partial congestion, and not to hæmorrhage, is evinced by the celerity with which they disappear under judicious treatment. When the cerebral congestion is very great, it constitutes a form of *apoplexy*, noticed in the article on that disease, and may occasion death without any further lesion than congestion merely.

142. *Appearances on dissection.*— The scalp, and even the bones of the cranium, in some cases, are of a red violet colour, and allow of a considerable quantity of blood to escape upon being divided. The vessels, and particularly the sinuses, are filled with dark blood. When the arachnoid of the pia mater is separated from the brain, a reddish patch, more or less deep, is formed, the vessels running through it being gorged with blood. The surface of the convolutions are of a more or less dark colour; and, when the cortical substance of the brain is divided, it is of a deeper hue than natural, the orifices of the cut vessels giving out drops of blood proportionate to their size. Upon dividing the medullary structure, which is usually not so white as in health, myriads of minute specks, becoming small bloody drops, rapidly form on the surface. The large vessels, and particularly the veins of the brain, are gorged with blood. When a person cured of repeated attacks of cerebral congestion, dies of a different disease, morbid appearances are seldom detected in the brain.

143. *Terminations and complications.*— Cerebral congestion may occasion *meningitis;* or *inflammation* and *softening* of the *substance* of the brain; or *hæmorrhage* iu some situation within the cranium, giving rise to complete *apoplexy*, or *palsy*, or both; and serous effusion in the ventricles, or between the membranes; many of the cases of *apoplexy*, attended with extravasation of blood, thus commencing in congestion, the extravasation being a consecutive change. It may also supervene on organic changes of the heart and lungs, and in the progress of various fevers, and thus be complicated with these diseases.

144. *Causes.*— The causes of this state of the cerebral circulation, are those which have been already detailed in the articles Apoplexy and *Cerebral Plethora* (§ 134.).

145. *Treatment.*—*Blood-letting*, general, local, or both, to an extent which the constitution, habit, and symptoms of the patient indicate, are requisite. Next to blood-letting, active purging by calomel, followed by a dose of senna, croton oil, or some other active cathartic, and promoted by strong cathartic injections, such as the oleum terebinthinæ, oleum ricini, extr. colocynth. comp., &c. are required, and should be repeated, so as to procure copious evacuations, and keep up sufficient action in the alimentary canal. The affusion of cold water on, or cold sponging the head,

is generally beneficial; and when the temperature is increased, and the countenance and conjunctiva flushed, a thick oilskin should be placed under the patient's head, which ought always to be kept elevated, and covered with cold epithems. Due attention should be constantly paid to the state of the evacuations. Accumulations of bile in the gall bladder or hepatic ducts, and of fæcal matter and morbid secretions in the alimentary canal, frequently predispose to or induce an attack, which will seldom altogether yield to the means employed, unless these morbid collections are removed by appropriate means: and as long as the evacuations continue unhealthy, we may infer that the chief cause of disorder is not altogether removed. (See *Treatment of* APOPLEXY.)

BRAIN — INFLAMMATION OF THE. CLASSIF. 1. *Class*, Febrile Diseases; 2. *Order*, Inflammations (*Cullen*). 3. *Class*, Diseases of Sanguineous Function; 2. *Order*, Inflammation, (*Good*). III. CLASS, I. ORDER (*Author*, see *Preface*).

146. NOSOL. DEFIN. — *Pain of the head more or less violent, with suffusion or prominence of the eyes; generally tumid or flushed countenance, delirium, or sopor, or both, or a marked predominance of either; with symptomatic fever; and frequently with lesion of the senses and functions of relation.*

PATHOL. DEFIN. — *Inflammation of either the membranes or the substance of the brain, or of both, generally with predominating lesion of either the one or the other.*

147. The recent researches of anatomists and pathologists have tended to advance our knowledge of the phenomena of inflammations of this important organ. The investigations of M. MAGENDIE, who has shown that its membranes exhale in health a limpid serum for the purposes of protecting the parts they surround, of facilitating the movements to which they may be subjected, and of accommodating and imparting a certain degree of superficial pressure, so that they may not suffer from the varying positions and states of vascular plethora to which they are obnoxious, have indirectly thrown considerable light on the pathology of the brain. Much, however, is still required to be known, not only as to the further relations which these membranes hold to the cerebral organs, in the performance of their healthy functions, but more particularly as respects the connection which subsists between their organic lesions and their symptomatic or functional disorders.

148. We know that the more internal and the most vascular of these membranes are chiefly appropriated to the distribution of the circulating fluid by means of the minute capillaries which it transmits to the external surface of the brain. We may thence infer that the functions, and even the organic conditions of the brain, in these situations especially, will be greatly modified, or even altogether changed, by the varying condition of the circulation in this membrane. When, therefore, it is the seat of inflammation, disease will be more or less extended to the substance of the brain; and will more or less influence the functions of this organ, particularly in the parts which it supplies with blood. The membranes, however, exterior to the pia mater, may be affected to a considerable extent without this latter participating much in the disorder: and here our knowledge is both imperfect and deficient in precision: for we are not enabled to state that in such cases the functions of the brain itself are undisturbed, or, if disturbed, in what manner the lesion of these exterior membranes affects this organ; and, being imperfectly informed respecting all the offices of these membranes, we are less able to trace the relation between healthy function and the phenomena which inflammation of them present. Surrounded thus with difficulties, which the advances of science will doubtless diminish, are we therefore to leave the subject without investigation, or relinquish the attempt to place in order and explain those facts which we have already obtained, and which may be made subservient to a further elucidation of the subject?

149. In no other organ of the body is it so difficult as in the brain, to trace the relation between demonstrable change of structure and morbid manifestations of function. This is partly owing, no doubt, to the circumstance of its being a double or symmetrical organ; lesions seated only in one half or side of the brain, when unattended by absolute disorganisation, not occasioning a corresponding degree of disorder as long as the same part of the other side is unaffected. *Delirium* has been conceived to be a symptom indicating the existence of inflammation of the membranes of the brain; yet delirium is a disorder of those functions which we conceive to be performed by the cerebral substance itself; and every experienced practitioner must have observed, and numerous are the cases on record, in which inflammation to a great extent, and all its consequences — as thickening, adhesions, effusions of lymph, or even of purulent matter — have been observed, and yet there had been no delirium. It is, therefore, to be inferred, that, when meningitis is accompanied with delirium, the disease extends more or less to the pia mater or parts enclosed by it. This inference, however, might lead to a conclusion which seems not well founded, viz. that it is impossible to distinguish meningitis as a disease independent of inflammation of the substance of the brain. This, doubtless, is often difficult, because both diseases frequently co-exist in different degrees, or co-ordinately; yet still an extensive experience will show that they often exist separately: and hence the necessity of ascertaining what are the characters which are proper to each. In respect of diagnosis, the subject possesses interest; and although the treatment in both is, in its principal points, the same, yet on some occasions it requires to be modified.

a BRAIN — INFLAMMATION OF ITS MEMBRANES. SYN. *Meningitis, Paraphrenitis et Phrenitis*, Auct. Var. Recent. *Arachnitis*, Parent and Martinet. *Cephalitis Meningica*, Good. *Phrénésie*, Pinel. *Méningite*, Fr. *Die Hirnhautentzündung*, Ger. *Brain Fever.*

150. DEFIN. *Acute pain in the head, with intolerance of light and sound; watchfulness, delirium; flushed countenance, and redness of the conjunctiva, or a heavy suffused state of the eyes; quick pulse; frequently spasmodic twitchings or convulsions, passing into somnolency, coma, and complete relaxation of the limbs.*

151. We are rarely enabled to distinguish between inflammation of the arachnoid membrane and that of the pia mater by the symptoms during life, I shall therefore comprise under the head of *meningitis*, inflammations affecting one or more of the membranes of the brain.

152. SYMPTOMS. — As the uses of the cerebral membranes are not rendered sensible by manifest functions, it may be concluded that diseases of these parts may exist to a considerable extent, without any distinctive symptoms. The justness of this observation is but too frequently confirmed by experience; for there are few practitioners who have diligently employed their opportunities of *post mortem* research, and have not observed appearances of inflammation, without much disorder of the intellectual faculties, or of the movements of the body, having been manifested almost up to the moment of death. Such instances are not rare, particularly in persons advanced in life. More frequently, however, when the membranes are inflamed, the adjoining portions of the brain, the functions of which they are probably intended to facilitate, evince some sort of disorder, particularly of their usual functions. These symptoms, although indirect, are generally similar to those of the inflammation of the cerebral substance itself, and are the chief guides to lead us to the recognition of meningitis.

153. The *symptoms* vary according to the seat of the inflammation, the stage at which it has arrived, the severity of the attack, and the celerity of its progress. The disease in its usual form presents three periods: 1st, that of invasion; 2d, that of fully developed inflammation; and, 3d, that of compression. Some one of these periods, however, does not always exist, particularly when the inflammation is very general or very circumscribed, or when it is very acute or very chronic in its progress. Meningitis affects more frequently that part of the membranes which covers the convexity of the cerebral lobes, in adult subjects; and the portions about the base of the brain, in young children.

154. *A. Acute meningitis* of the convexity of the cerebral lobes is attended with violent pain, which is exasperated at intervals, and often with stupor or somnolency. It occupies various regions of the cranium, the frontal, occipital, syncipital, &c., and is augmented by motion, particularly by rotation of the head, which in children is often drawn backwards. In this class of patients the pain is expressed, particularly upon being roused, by a *peculiar cry*, which the experienced observer recognises as a diagnostic sign of the disease, and after uttering which the infant sinks into a somnolent stupor, in which it grinds its teeth frequently. The functional derangements occasioned by meningitis are usually of a *general* character, although the inflammation is more frequently of limited extent. This is owing to both sides being attacked at the same time; cases where the meninges are inflamed on one side only being very rare.

155. *a.* Pain in the head is generally preceded by chills or rigors, which may be viewed as the result and indication of the formation of the disease; but cases not infrequently occur, wherein the foregoing signs in a greater or less degree precede the rigors even for a considerable time. The face at first is often pale; but, as the disease becomes fully developed it is more frequently slightly tumid, flushed, and expressive of pain, and the eye-brows knit or contracted; the eyes are heavy or brilliant, injected and watery, generally nearly shut, incapable of bearing the light, and the pupils contracted. The patient thinks he sees fire, or scintillations of light; and sometimes the colours of bodies appear differently shaded. The slightest noise is insupportable, and all the senses are in a state of morbid activity. His answers are brief and quick, and there is an evident activity of mind, but as yet no delirium. His disposition, however, seems changed; and he becomes impatient, irritable, abrupt, and quick in his manner, and his countenance is expressive of irritation and pain. The temperature of the head is now greatly increased; the pulse is frequent and developed; the tongue rather dry, its papillæ more or less erect and distinct; thirst is complained of; the urine is scanty and high-coloured, and the bowels are obstinately constipated; but in some instances, in children, either relaxed or irregular, and the evacuations morbid and offensive. From the commencement of the attack there is generally vomiting, particularly in children, which recurs at intervals, is unattended with tenderness or pain at the epigastrium, and is manifestly sympathetic of disease within the head.[a] In adult subjects, vomiting is sometimes absent. It is not infrequently remarked, that this stage either does not occur or passes unobserved in aged persons. The patient loses suddenly his recollection, as in congestion only of the brain; but to this succeed febrile symptoms, distinguishing it from this latter affection.

156. *b.* After an indeterminate period, commonly varying from one to three or four days, according to the intensity of the attack, violent delirium comes on, but not constantly. If the pain in the head continues, it is not complained of by the delirious patient; and the senses are no longer intolerant of their natural excitants; the pupils commence to dilate or to contract, and strabismus supervenes; the countenance has a convulsed appearance; the lips are drawn somewhat to one or both sides; the pulse is more or less developed, sometimes irregular and trembling, and is rarely at this period feebler or slower than natural; the tongue presents the same appearances already noted; the thirst, and frequently the vomiting, still continue. The temperature of the head continues excessive, but occasionally fluctuates, whilst that of the rest of the body is often not materially augmented.

157. *c.* To this state succeeds more or less marked exhaustion, which should not be taken for commencing resolution of the disease. The patient ceases to scream; and the symptoms of violence subside; but to these succeed startings of the tendons; carphologia, convulsive motions, and sometimes cramps, chiefly in the upper extremities. The pupils are dilated, contract with difficulty on exposure to light; the eyes are rolled in their orbits, become insensible, as well as the other senses, to the ordinary excitants; and a complete calm takes the place of the violent delirium; the patient even not answering questions put to him. He has had no sound sleep excepting a fatiguing stupor; he is now plunged in a profound coma. The limbs are, up

to this time, rigid and contracted, but soon become completely relaxed. This state is owing, generally, to the effusion of serum, which has now taken place; but it sometimes may exist without increased effusion; injection and congestion of the vessels of the brain, or compression, from whatever other cause, also producing it. At this period of the disease the face is pale, the eyes inexpressive, dim, half open, and drawn upwards; the cheek bones prominent, the temples hollow, the nose pinched, the ears cold; the lips dry, applied closely to the teeth, which are covered with a fuliginous coating at their base; the tongue is dry, hard, and brown; deglutition difficult, the abdomen distended with flatus, and the fæces and urine voided involuntarily. The skin is either cold, or covered by a viscid sweat; the pulse is small, unequal, or irregular; the respiration slow, sometimes stertorous; the expired air is cold and fœtid; and the patient dies generally in the course of a very few days, or from two to three weeks, and but rarely later.

158. These are the principal symptoms of acute meningitis of the cerebral hemispheres. They present irregular periods of exacerbation; the heat of skin and character of countenance varying at different times without any evident cause. The stages of the disease are not precisely marked; either of them may be wanting, and sometimes they seem as if confounded with each other. When the disease *terminates favourably*, the symptoms subside gradually; resolution taking place, sometimes with, but as frequently without, critical phenomena.

159. According to the observations of MM. PARENT, MARTINET, and ROSTAN, when the *membranes of the base* of the brain, or of the *ventricles*, are the seat of the inflammation, the symptoms are somewhat different. The patient then experiences less delirium, or even preserves his intelligence almost entire; his faculty of attention, and some of the other intellectual powers, being only diminished. He answers slowly, but rationally, to questions put to him; somnolency is almost continued, and coma more quickly supervenes. In other respects the symptoms are the same. Cephalalgia is complained of chiefly at the bottom and above the orbits; in general, the symptoms of irritation and excitement are less strongly pronounced than in the preceding form of the disease.

160. *B. Chronic meningitis* differs from the acute chiefly in the less intensity of the symptoms, and slow progress of the disease. In many cases the functions of sense and locomotion are but slightly disturbed, and usually the intelligence is unimpaired; at least, as long as the inflammation does not affect the membranes of the convexity of the hemispheres. When seated, however, in this place, according to M. BAYLE, who has devoted considerable research to this subject, delirium frequently is also present, but it is seldom violent; sometimes it is taciturn; and the patient generally is engaged with lofty or ambitious ideas.

161. Chronic meningitis commonly succeeds to the acute form of the disease; but it often presents the chronic characters from the commencement. There is generally continued headach, with slight somnolency, sluggishness, incapacity and want of desire for intellectual exertion, moroseness, irritability of temper, sometimes confusion of ideas, embarrassment of speech, and delirium, terminating in confirmed mania or maniacal idiotcy. The motions of the limbs are slow, difficult, or painful, and their muscles are subject to involuntary motions and twitchings, and sometimes are not under the control of volition, or are altogether paralytic. Vomiting and convulsions are rarely present, excepting in *infants*, where they are often the chief or almost only signs. In *children*, the peculiar knitting of the eye-brows, retraction of the angles of the mouth, whining or peevish cry, stupor, grinding of the teeth, scanty urine, obstinate costiveness, and increased heat of the head, are the chief symptoms; these being similar in kind, but much milder in degree than those accompanying the acute or sub-acute states of the disease. In many cases, both in children and adults, the functions of organic life present but few lesions of a marked description until towards the last period of disease, or shortly before death. It will be perceived that many of the phenomena here stated, belong to disease of the brain,—a circumstance which must necessarily obtain; for as the membranes surround the whole of this organ, and are one of the chief media of distributing the blood-vessels to it, any disease affecting its structure, or modifying the quantity or properties of the fluid secretion furnished by these membranes, for its protection, &c., must necessarily implicate the state of its functions.

162. *C.* The *duration* of meningitis necessarily varies with its intensity. In its *acute* form it extends from three or four days to twenty-eight, and even thirty; but more frequently from seven to fourteen days. In many cases it is difficult to assign the period of invasion; pain and somnolency having been complained of even for days before the occurrence of chills or rigors. The disease also not infrequently supervenes on other affections, and occasionally becomes *complicated* with them, particularly in the course of *hooping-cough*, and diseases of the prima via, when its invasion may be overlooked, or with difficulty ascertained. The more *chronic states* of meningitis have no determinate duration: they may proceed gradually and in a slight form, when, unexpectedly, from some exciting cause, or even without any evidence of such occurrence, they may assume an *acute* character, and terminate more or less rapidly.

163. *D.* The *organic changes* consequent upon inflammation of the cerebral membranes are observed chiefly in the pia mater, the arachnoid, and the reflection of the arachnoid covering the dura mater; and not infrequently, also, in the cineritious substance of the brain. These consist principally of injection and impregnation of the pia mater with blood, &c.; loss of the transparency of the arachnoid; effusion of serous or sero-albuminous fluids; and the various lesions particularly described in the preceding sections (§ 22—28.).

BRAIN—INFLAMMATION OF ITS SUBSTANCE.

SYN. *Phrenesis, Phrenismus,* Auct. Var. *Encephalitis, Enkephalitis,* Hildenbrand. *Cephalitis,* Auct. Var. Recent. *Encéphalite,* Bouillaud and other French Pathologists. *Cérébrite,* Foville. *Cephalitis Profunda,* Good. *Gehirnentzündung,* Ger.

164. DEFIN. *Pain of the head; vertigo; altered sensibility; spasms, or contractions, of one or more limbs; excited or deranged functions of sense and intellectual power; rapidly terminating in coma.*

165. I have stated that meningitis manifests itself to our senses chiefly by the lesion of the cerebral functions; and that this is occasioned in two ways, viz. by deranging and impeding the functions of the brain, which these membranes are intended to facilitate; and by imparting the inflammatory action to those parts of the brain contiguous to them. But although the relative connection of parts thus necessarily increases the difficulty of distinguishing the symptoms proper to the membranes, or to the brain itself, still there are certain signs which enable us to infer the degree to which either may be separately affected. We shall see in the sequel, that, in cerebritis, the organs of voluntary motion exhibit frequently morbid phenomena which are generally limited in extent; whilst we have seen, in meningitis, these organs are affected generally, and seldom or ever partially, excepting when complicated with inflammation of some portion of the brain; and if, in cerebritis, all the voluntary actions are affected, the inflammation has commenced in the membranes, and extended itself to the substance of the brain, — the disease existing as meningitis and cerebritis conjoined, which is, perhaps, its most common state, and in which I shall presently consider it.

166. SYMPTOMS. — *A. The more immediate functional derangements.* The functions of the brain consisting of sensation, volition, instinctive desires, intelligence, and moral sentiments, it is evident that the phenomena of the disease should be sought after in this series of manifestations; and that they will vary, in respect of their particular states, their intensity, and progress, according to the seat, the nature, and extent of the organic change.

167. *a.* When *cerebritis is general*, it often presents the same functional disturbances, and the same progress and stages, as meningitis: it is, indeed, very probable that both diseases co-exist, and that the inflammation commences in the pia mater. However, when the whole cerebral mass is inflamed, coma, with relaxation of all the limbs, takes place much earlier than in meningitis; and the disease developes itself with extreme rapidity; the symptoms of vascular excitement scarcely showing themselves, or, at least, for a very short time; and being frequently altogether absent. This difference is readily explained, when we consider that, in meningitis, the brain being only secondarily and slightly affected, it may still exercise its functions, although in a deranged manner; whilst in general cerebritis, the change being extensive, its functions must necessarily be suspended. The patient, after a rigor, which ushers in this as well as the majority of other inflammations, sometimes loses recollection; but he has generally experienced other symptoms previously, such as obstinate pain of the head, twitchings, pricking sensations, slight numbness or diminution of the sensibility, with painful muscular action, vertigo, sudden want of recollection, and tinnitus aurium. Sometimes the sensibility is morbidly increased at this stage, as well as the functions of sense; the intellects are active, or excited; and there is watchfulness, with other analogous symptoms, for a longer or shorter period before the patient is seized with rigors and insensibility.

168. *b.* These *precursory symptoms* M. ROSTAN considers as the result of an incipient disorder, which he conceives to be local congestion, and that inflammation has not then taken place; but they are, more obviously, signs of an early period of inflammatory action. These symptoms are frequently accompanied with general signs of plethora or determination of blood to the head: the pulse, particularly of the carotids, is hard, or full and developed; the countenance is injected; the skin hot, &c. The same precursory signs are likewise observed in softening of the brain; but in this affection the pulse is not augmented in frequency or fulness, the skin is cold and pale, and the countenance pale or shrunk. The symptoms now described indicate, at least, that morbid action has commenced in the brain; and that it is not so extensive or intense as not to subside under judicious treatment. But when the patient has had rigors, the functional disturbance, especially of locomotion, is particularly marked: then ensue clonic or tonic spasms of the muscles, such as startings of the tendons, carphologia, convulsions, cramps, rigid contraction of the limbs, &c. At a more advanced period, particularly when effusion supervenes, paralysis or relaxation, and loss of sensibility of a limb or limbs, take place.

169. *c.* When cerebritis is *general* (which is never the case without the pia mater being inflamed), these symptoms affect all the limbs simultaneously; when *local*, only some of them, according to the seat of inflammation. Spasms, convulsions, or paralysis, affect also the muscles of the face; there is a falling down of the upper eyelid; the eyelids are shut and contracted; the commissures of the lips are drawn to one side, either by their natural tonicity, when the antagonist muscles are paralysed, or from a morbidly increased action. Sometimes this exists on both sides, producing retraction of the angles of the mouth. Very frequently the muscles and limbs are remarkably painful; so that, when attempts are made to move them, or to straighten those that are contracted, or upon attempting to move himself, the patient screams out.

170. *d.* In *partial cerebritis*, the action of the muscles and the sensibility of the surface are also partially, but not permanently, affected; some parts being less disordered, whilst the affection extends to others; or they all become more severely and permanently diseased; the spastic contractions, which existed at first owing to inflammatory irritation, giving place to paralysis, in consequence of pressure or disorganisation. The intellectual faculties are also frequently disturbed. The patient's answers are abrupt, rapid, sometimes incoherent, and at other times made very slowly. When merely one hemisphere is affected, it has been supposed that the functions of the other will proceed so as to prevent the appearance of much disturbance of the mental faculties; but this may or may not be the case; and, at least, can only occasionally obtain. The mental disturbance, which is extremely various in its forms and states, according to the part of the brain affected, exists only during the first days of the disease, and is soon displaced by coma.

171. *e.* At the commencement, particularly when cerebritis is general, or affects the periphery or more superficial parts of the brain, as in meningitis, or meningitis complicated with superficial cerebritis, the functions of the senses are morbidly increased, the least light or noise, or the slightest touch, being insupportable; but when the disease is seated in the centre of the brain, where the senses transmit their impressions, there is either perversion, or complete loss, of these functions. The pupils are then frequently dilated and insensible; the eyes unaffected by light, the ear by sounds; and the other senses are similarly disturbed; the patient is either watchful, or is oppressed by a somnolency intermediate between sleeping and waking; and numbness, with twitchings, or local convulsions, are generally observed.

172. In the course of a period, varying from one to three or four days, or sometimes earlier, and occasionally later, the symptoms are changed, owing to the local affection having advanced to disorganisation. At this *period*, copious effusion of serum often takes place, occasioning symptoms of compression. The spasms and convulsions are replaced by relaxation and immobility; and the senses are paralysed, not only on the side opposite to the cerebral lesion, but on both sides simultaneously, owing to the healthy parts of the brain being compressed by the effused serum, or by the tumefaction of the parts inflamed. Sensibility diminishes rapidly, and is at last abolished; the intellects are obscured, and at last overwhelmed, and the patient becomes profoundly comatose; or, in the less acute or chronic cases, hemiplegic, and sometimes ultimately apoplectic, or epileptic.

173. *B. The mediate symptoms.* — During the first days of the disease, the countenance is full and coloured; the eyes brilliant and animated, their expression unusual; the temporal arteries, as well as the carotids, beat strongly; there is no appetite; the tongue is white, loaded, red at its margins and point, and the papillæ developed; there are nausea and vomiting; the bowels are costive; but occasionally in children there is diarrhœa from the commencement, and the evacuations are morbid and offensive; the skin is warm, the pulse strong and frequent, and the respiration accelerated. At a later period, a very manifest change ensues: the countenance is expressive of pain, irritation, and chagrin; the features begin to sink, and become pale; the eyes dull and half closed; and thirst is no longer complained of; deglutition is difficult, or cannot be accomplished; vomiting is produced with difficulty; the abdomen is distended with flatus; and the fæces are passed involuntarily, as well as the urine, which sometimes accumulates in the bladder from paralysis of this organ; the skin becomes cold, or covered by clammy sweat; the pulse is unequal, irregular, or variable; the respiration laboured, or stertorous; and the patient sinks. In rare cases, at this stage of the disease, the symptoms diminish, and the functions gradually assume their natural states, either with or without the occurrence of phenomena which may be regarded critical. The *alterations of structure produced by cerebritis* are fully described in preceding sections of this article (§ 48, *et seq.*).

Brain—Inflammation of the Membranes and Substance of the. Syn. *Phrenitis* (from φρὴν, the mind); *Encephalitis, Cephalitis* (from κεφαλη, the head) Frank and Hildenbrand. *Phrénésie, Encéphalite,* Fr. *Hirnentzündung,* Ger.

174. Defin. *Violent pain in the head; prominent suffused eyes; flushed countenance; violent delirium, followed by profound sopor.*

175. Having described inflammation affecting chiefly either the membranes, or the substance of the brain, I now proceed to consider inflammation attacking these structures simultaneously, or rapidly extending from the one to the other, chiefly from the former to the latter. This is certainly the more common form in which inflammation seated within the cranium manifests itself in adults, particularly in *hot countries,* and in temperate climates during *hot seasons.* In *children,* however, a more or less evident limitation of the inflammatory action to either the membranes, or the cerebral substance, especially the former, is frequently perceived; and the same remark may be extended to aged persons, in whom the substance of the brain is more liable to be affected, chiefly in a sub-acute or chronic form. That the division which I have made of inflammations of the brain, is founded in truth and that their diagnosis may be established in practice by a judicious and experienced physician, I have had numerous opportunities of proving at the Infirmary for Children, where the cases admitted with inflammations seated within the head have been entered as cases of meningitis, cerebritis, or encephalitis, as the membranes, the substance of the brain, or both, respectively, were considered chiefly affected.

176. It may be supposed, that the distinctions argued for, granting their accuracy, tend to little practical advantage. This is, however, a very serious mistake; and I cannot more fully demonstrate it, than by the following fact: — About ten years since, I was requested to see a child, attended by an able and scientific practitioner, who considered the case as meningitis, which had terminated in effusion; or, in other words, of acute hydrocephalus in its advanced stage, and perfectly beyond the reach of art. After an attentive consideration of its history and existing state, I expressed the opinion, that the disease was inflammation, chiefly affecting the substance of the brain, and that a decided treatment founded on these views might still be successful. Leeches applied behind the ears, and around the occiput, with the means which will be hereafter detailed, succeeded in restoring the child to health in a few days. Since this instance, I have witnessed similar mistakes. The diagnosis, prognosis, and the treatment adopted in these cases proceeded on the important fact already stated (§ 167.), that cerebritis will, owing to the turgescence of the inflamed organ, give rise at a very early stage of the disease to the most profound coma, relaxation of the limbs, and many of the symptoms occasioned by effusion of serum; whilst the greater temperature of the head, and strength of the pulsation of the carotids in the former, will often, independently of other signs connected with the history of the case, evince its real nature.

177. Seat. — In the greater number of cases, inflammation commences in the pia mater, and extends itself to the arachnoid on one side, and to the cortical substance of the brain on the other;

and not infrequently also to the arachnoid covering the dura mater, and the deep-seated structures of the brain. It is also very probable, that more than one of these different structures may be nearly simultaneously affected. It may, however, originate differently when it arises from external injury; as in the dura mater, the substance of the brain itself, or the arachnoid.

178. I. SYMPTOMS. — *A. Premonitory.* Encephalitis generally commences with a sense of heat and fulness in the head; frightful dreams, and unquiet sleep; forgetfulness; confusion of ideas; dimness of sight; vertigo; turgidity of the face and eyes; and moroseness of temper. These symptoms generally precede the occurrence of chills or rigors, and are entirely absent when the disease proceeds from external injuries. In *children*, unusual somnolency, or wakefulness; startings in sleep, or fretfulness; aversion from sudden or quick motion; dryness of the mouth and nostrils; and not infrequently a voracious appetite; are the chief precursory symptoms.

179. *B.* The *invasion*, or *first stage* of encephalitis, is indicated by severe chills or rigors; to which succeed a burning heat of the head; urgent thirst; sometimes, even thus early, an unnatural absence of thirst, and violent delirium; jactitation of the body; intolerance of light; fixed, pulsating, heavy, compressing, and most severe pain of the head, alternating frequently with stupor. Febrile heat rapidly increases; and the head becomes more turgid, and hotter; the eyes more prominent, suffused, watery, and intolerant of light; the pupils are contracted; the eyelids are generally shut, or imperfectly open; the eyebrows are knit; and the countenance is threatening and fierce. Hearing is quicker, is attended with ringing in the ears, and intolerance of sound. Epistaxis sometimes occurs, generally to a small extent, and with only transitory benefit. Insomnia, and *delirium* of various forms — morose, taciturn, furious, &c. — supervene; and, in proportion as the cerebral organs are excited, those viscera which are supplied with the ganglial nerves are rendered torpid, the patient being insensible to the wants of the digestive organs.

180. *C.* The *second*, or *advanced stage*, is generally characterised by a marked diminution of the sensibility, which was in the preceding period morbidly increased. The pulse, which was at first frequent, hard, and full, becomes slower, fuller, and softer; and, in some cases, quicker, smaller, or harder. The skin is dry; the urine scanty, and high coloured; the tongue is dry, and loaded at the root; the bowels constipated. In some cases, particularly those in which the cerebral substance is early and generally inflamed and turgid, instead of phrenetic delirium, an apoplectic sopor, often preceded by convulsions, quickly supervenes; with a slow pulse; stertorous, slow, or laborious breathing; turgid or bloated countenance; startings of the tendons; involuntary evacuations; torpor of the senses; and flaccidity of the limbs. In those cases in which delirium is present, and the pulse quick and hard, a similar state of coma to that now mentioned takes place sooner or later, if not averted by medical aid. In the one, the first stage is short and indistinctly marked; in the other, it is long, and often continuing the greatest part of the whole duration of the disease; the second stage sometimes appearing suddenly, and terminating rapidly. In both these states of the disease, the difficulty of swallowing is great, so that fluids are sometimes regurgitated by the nose; and when the substance of the brain is chiefly affected, deglutition is often nearly, or altogether abolished in the most intense cases. In this stage, the pupil becomes at first dilated, and occasionally again contracted; the patient, in some cases, squints, or has double vision; his speech is often much affected; and his mouth is drawn to one side. Deafness also comes on, or increases; and the sopor, or coma, is more profound—most probably owing either to incipient effusion of fluid, or to greater turgidity of the capillaries and veins, or to both these combined, in a part or the whole of the encephalon. The comatose symptoms appear early or late, according to the intensity of the disease, the extent to which the cerebral structure is affected, and the tone and energy of system. They sometimes partially subside, again recur, or alternate with convulsions. As the disease advances to an unfavourable termination, the pulse becomes remarkably quick, irregular, or intermittent.

181. *D. Duration.* — Encephalitis usually reaches its acmé about the third or fourth day. It then continues in full strength for several days, exhibiting slight remissions and exacerbations, and simulating continued fevers. In favourable cases, a *change* is sometimes observed on the fifth, seventh, or some other critical day, unless a fatal termination occur; and is generally attended with either copious perspiration, or hæmorrhage from the nose, free evacuations from the bowels, or a discharge of urine depositing a copious sediment. The disease may assume a *sub-acute* or a *chronic* form, presenting a diversity of symptoms, especially in its chronic state, according to the particular part of the brain affected; or it may proceed in a very slow, slight, and insidious manner, and escape detection until a dangerous or fatal change has taken place. The more chronic states may follow an imperfectly cured acute attack; and the latter may suddenly supervene on the former.

182. II. CAUSES. — *A. Predisposing.* The sanguineous and nervous temperaments; the epochs of infancy, childhood, and youth — particularly to meningitis; the period of dentition; advanced age — especially to cerebritis in a sub-acute or chronic form; the male sex; a large head and short neck; children of scrofulous parents, and those who evince precocious talent or acquirements; persons subject to perspirations or eruptions on the head; early or habitual exertions of the mental powers; the indulgence of the more active passions and affections; encouragement of vindictive feelings; anger; continued watchings; venereal excesses; the use of spirits, and narcotics, as opium, tobacco, &c.; a too warm state of the head; suppression of epistaxis, hæmorrhoids, or of any other accustomed secretion or evacuation; the neglect of sanguineous depletion after the habit has been established; the healing up of chronic ulcers and eruptions; and other disorders of the brain,—are most frequently the predisposing circumstances and causes of the disease.

183. *B.* The *exciting causes.*—*a.* Those which act more *directly* on the encephalon, are blows, fractures, falls, counter-strokes or concussions of

the head, all which may not be followed, for many days, by any evident symptoms; whirling children in the air, or tossing them in order to quiet them, or rocking them rudely in cradles; the improper use of narcotics and stimulants in order to quiet them; the action of the sun's rays; protracted study; excessive joy; violent fits of anger, excessive desire, jealousy, and all the exciting passions; unusual exertion or irritation of the senses of sight and hearing; exostoses on the inner table of the skull; and the absorption of purulent or morbid matters into the circulation. *b.* The causes which act more remotely or *indirectly*, are the diseases with which I have stated encephalitis to be sometimes complicated (§ 186.); nervous or bilious headachs; all painful affections; mania; inflammations of the ear; disororders of the stomach, diaphragm, liver, and bowels; affections of the sexual organs; ingurgitation and intoxication; the exanthemata, particularly when imperfectly developed on the external surface, or upon the disappearance of the eruption; the metastasis of gout, rheumatism, and erysipelas; suppressed hæmorrhages and evacuations, particularly the menses and the urinary secretion; the accumulation of sordes and morbid secretions in the prima via and gall bladder; the ingestion of irritating and narcotic poisons; indulging in cold punch (FRANK); violent fits of coughing; long exposure to great cold; and, according to GOELIS, the too free use of *belladonna*, and other narcotics, in the cure of hooping-cough.

184. III. DIAGNOSIS.—*A. Characteristic symptoms. a.* Pain is an early sign, but the patient often ceases to complain of it very soon, particularly if the cerebral substance be chiefly inflamed; when it is also gravative, and attended with stupor from the commencement. It is most acute when the membranes are affected, and is always aggravated by shaking the head, and the erect position. When the disease supervenes in the progress of fevers and bronchial affections, pain may not be complained of, owing to the impure state of the blood having blunted the sensibility. *b. Watchfulness and sleep.*—Insomnia is generally present during the first days, when the membranes are affected; and, in children, starting from sleep, and screaming. Heaviness, somnolency, sopor, or even coma, often preceded by convulsions, are early present when the substance of the organ is the chief seat, or the membranes extensively affected; and supervene early, but without convulsions, when the disease occurs in the course of fevers and bronchial affections; but a refreshing sleep is never enjoyed, unless after a favourable change. *c.* The *senses*, particularly sight, hearing and touch, are all morbidly active in the first stage, especially when the meninges are inflamed; but they are nearly abolished at this period, when the cerebral substance is chiefly affected. The eye often indicates mental oppression, even when bright and staring. The *sensibility* of the surface is unnaturally increased in meningitis or superficial cerebritis, but is diminished when the substance of the brain is deeply affected, and in the advanced stage, when the membranes generally are inflamed. In partial cerebritis, the sensibility of a limb, or part only, is often lost, and it may be conjoined with spastic rigidity, or paralysis, of the same or of another part. *d.* The *intellectual* and *moral* faculties are more or less disordered; they are unusually excited, or violently deranged, early in the disease; but sopor frequently supervenes without being preceded by this state, when the cerebral structure is inflamed. Reverie or wandering of the mind during night, is the least important form of mental disturbance, indicating a slight affection of the pia mater, extending to the cineritious substance; delirium through the day, and watchfulness in the night, are the most dangerous, and attend a severe affection of the membranes. *d.* The *respiration* is often quicker in proportion to the pulse in the first stage, and slower in the second; and in the torpid or somnolent state, when the substance of the organ seems chiefly to be affected, is often attended by deep-drawn sighs. *e.* The *digestive organs* are much affected, particularly in children. There are nausea and vomiting, especially at the commencement, and torpor of the bowels. As the disease advances, however, the bowels often become free, or even relaxed. *f.* The *muscles* and *limbs* are more or less pained, contracted, convulsed, particularly in the first stage, and when the cerebral structure is inflamed. The convulsions are often general or severe, on the supervention of the disease, in young subjects. They may be soon followed by coma, which may pass off, and the convulsions again recur, and terminate life. When the cerebral substance is partially affected, the spasms and contractions may be confined to one or more limbs, whilst the rest are relaxed; or complete paralysis may ensue. In the last stage, muscular power is generally lost, and the limbs are flaccid. *g.* The *pulse* is extremely variable. At first it is not remarkably frequent; but it often becomes slower, and again quicker than ever, and at the same time weak, small, irregular, or intermittent. It may be at one time either slow or frequent, and in a few minutes the reverse; but it is never natural in respect of fulness, regularity, or strength. It is generally stronger and fuller in the carotids than elsewhere; and in this situation it ought always to be felt.

185. *B. Encephalitis* may be mistaken for other diseases; but if attention be paid to the history of the case, and the descriptions now given, this can scarcely happen. It may, however, be confounded with *fevers*, *apoplexy*, *delirium tremens*, *mania*, and *nervous headachs*. *a.* In *fevers*, the disturbance of the cerebral functions, when prominently marked, generally occurs in their progress, as a complication or consecutive affection. The pulse is always more uniformly frequent and regular than in encephalitis; spasms, convulsions, or paralysis, seldom occur, unless the brain becomes inflamed; respiration is not laborious, nor deglutition difficult; nor are the eyes, countenance, and speech affected, as in encephalitis. In idiopathic fever, the muscular power is depressed from the commencement, but is neither generally nor partially affected by spasms, contractions, or paralysis; and the stomach is less remarkably disordered. There is not observed that falling of the pulse from its former frequency, afterwards followed by great rapidity, trembling, or irregularity, which take place in encephalitis. In fever, the general febrile symptoms are the earliest and most apparent disease; in encephalitis, the functions of the brain, of sense, and of the organs of volition, are prominently and early disordered, and the febrile symptoms much less re-

markable in proportion to the severity of the cerebral disease. When the coma is profound in encephalitis, the heat of the whole body, excepting the head, is either not augmented, or depressed. The delirium in fevers also occurs at a remoter period, and is much less violent in its character, than in encephalitis. *b.* The *disturbance* of the organic, and particularly the digestive functions, the presence of fever, and the acute character of the disease, distinguish it from *maniacal insanity*. *c.* The same symptoms, with the frequent addition of delirium, of disturbance of the senses and general sensibility, spasms or convulsions, somnolency, sopor, and paralysis, preclude the possibility of confounding it with *bilious* or *nervous* headachs. *d.* Somnolency, sopor, convulsions, and slowness of the pulse, distinguish it from *delirium tremens*, in which the spectral illusions, the remarkable tremors, timidity; copious, clammy, fœtid perspirations; and the specific cause of the affection; sufficiently characterise the latter, when occurring in a distinct and uncomplicated form. *e.* The spasmodic or convulsive symptoms, antecedent delirium, the mode of attack, and progress of disease; the absence of paralysis, or its slower accession when the brain is inflamed, distinguish encephalitis from *apoplexy*, in which the invasion is sudden, or more rapid, and the paralysis a simultaneous or consecutive symptom. The relation, however, between apoplexy and encephalitis is often intimate, particularly in cases of partial inflammation, or inflammatory softening, of the substance of the organ.

186. IV. STATES, FORMS, AND COMPLICATIONS. — Besides the more or less perfect limitation of inflammation to either the membranes or the substance of the encephalon, other states may present themselves deserving of remark. *a.* Encephalitis may result from the *metastasis* of gout, rheumatism, and erysipelas, or it may arise from the *extension* of the last-named disease to the brain. In these cases the membranes are chiefly affected; stupor and coma come on early, and are attended with general flaccidity of the limbs, subsultus tendinum, involuntary evacuations, and slowness of pulse; but local cramps, convulsions, or paralysis, are seldom present. *b.* The disease may be also *consecutive* of other diseases, as of inflammation of the ears (§ 58.), of the bones of the head or pericranium. In these cases it is first extended to the membranes, and afterwards to the substance of the organ; occasioning contraction, spasms, or paralysis of one or more limbs, or muscles of the face, terminating in coma, or alternating with stupor and general convulsions. It may also be consecutive of severe ophthalmia, inflammation of the parotids or testes, of the kidneys, of inflammation of the mucous surface of the bowels, especially in infants, and of the diseases of the lungs. *c.* Encephalitis may likewise *supervene on*, and be *complicated* with, the advanced stages of continued and remittent fevers, bronchial and pulmonary affections, hooping cough, exanthematous fevers, particularly scarlet fever, and small pox. In all these cases the membranes and superficial parts of the brain are principally affected, generally in a more or less diffused manner, occasioning first delirium, general convulsions in young children, great pain in the limbs, sensibility and soreness of the surface, followed more or less rapidly by sopor, coma; more rarely by local spasms and paralysis, involuntary evacuations, rapid irregular pulse, &c. The complication with typhoid, continued and exanthematous fevers, especially those of certain epidemic constitutions, is extremely frequent and important; and have given occasion for the opinions entertained by WILLIS, CHIRAC, WERLHOF, REIL, PLOUCQUET, CLUTTERBUCK, and MARCUS, respecting the proximate cause of fevers. To this complication also TORTI attributes the malignancy occasionally assumed by the remittents and intermittents of the south of Europe. When it thus supervenes on fevers and bronchial diseases, the symptoms are often more insidious, and of a less violent character, although the disease is equally rapid and disorganising. This is probably owing to the depressed state of the vital manifestations, particularly of the organic nerves and vascular system. Owing also to this circumstance, encephalitis, when thus complicated, requires a modified and less depletory treatment. Inflammation of the brain is also not infrequent after apoplectic seizures, particularly in the part of the organ surrounding extravasated blood. In these cases the disease generally occurs from five or six to ten or twelve days after the attack, and is attended with many of the symptoms of partial encephalitis, particularly spasms, paralysis, delirium, &c.

187. V. TERMINATIONS AND PROGNOSIS.—*a.* This is always a dangerous disease, and therefore a very cautious *prognosis* ought to be given. The termination of encephalitis in *health* occurs most frequently in persons of a sound constitution, and who have no hereditary disposition to the diseases affecting the encephalon. This change often occurs on critical days, when it is generally attended by some favourable occurrence, as a copious discharge from the bowels; a genial and universal perspiration; a copious discharge of urine, depositing a sediment; hæmorrhage from the nose, or the presence of the menses; a more natural state of the pulse and respiration; a quiet undisturbed sleep, distinct from the oppressive somnolency or sopor which is one of the chief signs of the severity of the disease; a more moist, natural, and clean state of the tongue and gums; a decline of the temperature of the head, and of all the other symptoms.

188. *b.* A *fatal termination* may take place, 1st, In the inflammatory stage, owing to the very general extension of the disease to the membranes and substance of the organ; the pressure and interrupted circulation arising from the turgescence of the inflamed organ annihilating its functions (§ 48. 167.): 2d, In a further advanced stage, from an effusion of serum, sero-albuminous fluid, or the deposition of false membranes (§ 21—28.): 3d, In the less acute cases, and at a still more advanced period, from suppuration or inflammatory softening of a portion of the brain (§ 50—76.): and, 4th, This issue may proceed from any two, or the whole, of these changes being conjoined in the same case. The *indications* of an unfavourable termination are, the persistance of the urgent symptoms after treatment; violent delirium, watchfulness, and restlessness; profound lethargy or coma, or the alternation of these states; violent general convulsions, followed by coma, or alternating with it; a morose delirium; retraction of the head; severe pains of the limbs, followed by cramps,

contractions, or palsy; hæmorrhage from the ears; difficulty or impossibility of deglutition; strabismus, or double vision; loss of speech; slowness of pulse, followed by a sudden increase of frequency; a trembling or irregularity of pulse; obstinate vomiting, particularly of a greenish fluid; singultus, continued or recurrent; the rapid healing of chronic ulcers; the appearance of the disease in the course of other maladies, particularly pneumonia, the exanthemata, and after apoplexy, and in the scrofulous habit, or in persons having an hereditary disposition to cerebral affections, or who have been recently affected by other maladies.

189. *c.* The disease may pass into an obscurely chronic form, which, together with the effects produced by its antecedent state, may give rise to paralysis, epilepsy, various states of mania or mental disturbance, idiotcy, &c. In these cases, many of the chronic changes which have been described as occasionally found in either the membranes or the substance of the brain, particularly those which affect parts only of these structures, have taken place, as softening, abscess, induration, tumours, ossific formations, &c. (§ 50. 71. 102, &c.).

190. *d.* When encephalitis arises from *rheumatism* (*Encephalitis Rheumatica*, J. FRANK), the membranes, particularly the dura and arachnoid, are chiefly affected; and the danger has been considered, upon the whole, less than in other states or relations of the disease. The disposition, however, to effusion, and to many of the chronic organic changes described as frequently found in the membranes, is great. It often assumes a sub-acute or chronic form, and is usually attended with great distress, but is without delirium. The *gouty form* of encephalitis generally is observed in older persons than the rheumatic; is accompanied with much disorder of the stomach, liver, and bowels, and with deficient vital power; and is hence a more dangerous state of the disease. The same remark is applicable to its occurrence from the extension or suppression of *erysipelas*. In these, the re-appearance of rheumatism or gout in a joint or extremity; the eruption of the erysipelatous inflammation in any part of the surface, even in the face (J. P. FRANK); the supervention of diarrhœa, the hæmorrhoidal flux, or any other discharge; are favourable circumstances. Encephalitis, occurring after the disappearance of the eruption in the exanthemata, or during the course of typhoid or epidemic fevers, or pulmonary diseases, or after attacks of apoplexy, paralysis, epilepsy, or mania, is much more dangerous than when appearing in a primary form, owing, 1st, to the depression of the vital and nervous powers; 2d, to the vitiated state of the circulating fluids; and, 3d, to the silent and insidious manner in which the disease of the brain often advances to disorganisation in these complications. According to HUFELAND, encephalitis, supervening on the disappearance of the variolous eruption, is generally fatal. The *alterations of structure occasioned by encephalitis* are fully described in preceding sections of this article (§ 11, *et seq.*).

191. VI. TREATMENT.— *A. Of the idiopathic and simple encephalitis.* It must be evident that the treatment should be the same, whether the membranes or the substance of the brain be chiefly, or entirely, the seat of disease. The *causes,* the the age, the habit of body, and apparent state of vital power, are circumstances which ought to be duly considered when adopting the means of cure, or determining upon the extent to which they ought to be carried. *a.* The *antiphlogistic treatment*, in all its departments, must be rigorously enforced. Some discretion is, however, required as to the extent to which it should be carried, and the direction, choice, and adaptation of the individual means of which it consists. In ordinary cases, bleeding from the jugular vein; cupping between the shoulders, nape of the neck, behind the ears, or occiput; leeches applied in those latter situations, and bleeding from the arm, are upon the whole the preferable modes. Arteriotomy I consider to be attended with no advantages; and in this I am supported by the opinion of HILDENBRAND and others; but bleeding from the feet, from the hæmorrhoidal vessels, and from the groins and insides of the thighs, are undoubtedly preferable when the disease arises from metastasis or the interruption of discharges, especially when conjoined with the treatment I shall presently describe as appropriate to those states. HILDENBRAND, and several other German physicians, recommend the application of leeches to the insides of the nostrils, when the patient has been subject to epistaxis, or if a disposition to critical epistaxis be evinced. As to the extent to which depletion should be carried, no precise opinion can be given. It should be regulated according to the circumstances of the case, and its effects upon the circulation, and be conducted in the manner I have recommended in the article on the *Pathology of the* BLOOD (§ 64.). It ought never to be relied on alone: other means should be simultaneously, or subsequently, employed, with the view of diminishing local and general action, and thereby preventing the removal of more blood than may be indispensable.

192. *b.* The hair should be removed from the head as soon as possible, and a *stream of cold water* poured upon it from time to time, or every second or third hour, until the temperature be reduced to the natural standard; and, as morbid heat soon returns, *cold epithems,* or evaporating lotions, or even pounded ice enclosed in a bladder, should be constantly applied in the intervals between the *cold affusions,* and the head be kept elevated, and placed upon a thick oil-skin, or, what is still better, upon a piece of common painted floor-cloth, as long as increased action continues. Cold applications or affusions may, however, be injurious if too long persisted in. They ought never to be continued after the temperature is depressed to the natural standard, or a little below it, particularly if sopor or coma be present; and as soon as the heat returns, they should be again resumed. Simultaneously with the affusion, the feet and legs should be immersed in warm water, or in warm water made irritating by means of salt and mustard, and the saphena vein be opened. In some cases, particularly when suppression of the menstrual or hæmorrhoidal discharge has preceded the attack, the *semicupium,* or *hip-bath,* may be substituted for pediluvia.

193. *c.* The immediate exhibition of *cathartics* should not be neglected. From ten to twenty grains of calomel may be given at once, and, three or four hours afterwards, an active purgative

draught, which should be followed by cathartic enemata, particularly the *En. Cathart.* and the *En. Terebinth.* (F. 141. and 150.). By these, or similar means, a copious action of the bowels should be procured and continued. With this latter intention, pills calculated to promote the abdominal secretions may be given each night, a purgative draught the following morning, and an enema subsequently, if it be necessary. Calomel combined with digitalis, or with antimony, should be prescribed in full and frequent doses, in addition to the above, so as to change the state of morbid action, particularly when the membranes are chiefly affected. The following, or similar medicines, may be used, and their effects carefully watched: —

No. 55. ℞ Calomel. gr. iij.—x.; Pulv. Jacobi Veri gr. iij.; Pulv. Digitalis (vel Pulv. Colchici) gr. j.—ij.; Syrup. Simp. q. s. M. Fiant Pilulæ ij. vel iij. tertiâ, quintâ, vel sextâ quâque horâ porrigendæ.

No. 56. ℞ Hydrarg. Submur. gr. iij.—vj.; Pulv. Jacobi Veri gr. iij.—vj.; Extr. Colocynth. Comp. gr. vj.; Syrup. Simp. q. s. Fiant Pilulæ iij. horâ somni sumantur.

No. 57. ℞ Infus. Sennæ Comp. ℥ jss.; Magnes. Sulphatis ʒ ij. (vel Potassæ Tart. ʒ jss.); Vini Antimon. Tart. ʒ ss.; Tinct. Jalap. ʒ j.; Tinct. Cardam. Co. ʒ j. M. Fiat Haustus, primo mane sumendus.

194. *d.* In addition to these means, the frequent exhibition of *refrigerants* and saline medicines, especially those consisting of the *liquor ammon. acet.*, *potassæ nit.*, *antimonials*, &c., will be of much service. The preparations of antimony, judiciously exhibited, have a remarkable influence in diminishing determination of blood to, and inflammatory action in, the brain; and I believe that the effect will be more decidedly beneficial, if their operation as an emetic be carefully avoided. Form. 24. 359. 406. 436. 456. and 854. are of the above description, and, as well as others of a refrigerant and diaphoretic nature, may be employed, in small or moderate, and frequently repeated doses. I may state, as the result of considerable experience, that I have found the *saline refrigerants* and antimonials most beneficial during the early stage of the disease, and where the membranes were chiefly inflamed. In the stage of coma, or when the substance of the brain itself is affected, and the pulse quick, weak, small, trembling, or irregular, antimonials are not admissible; the preparations of *camphor*, with *liquor ammon. acet.* and *spirit. æther. nit.*, being preferable. (See F. 405. 436. 441.)

195. *e. Sedative* and *diuretic* medicines, particularly *colchicum* and *digitalis*, combined with the *liquor ammoniæ acet.* and moderate doses of camphor (F. 395. 400. 514.), are extremely useful in the early stage of the disease, after depletion and the free evacuation of the bowels. In the advanced stage, however, much less advantage will be derived from them. After bloodletting has been carried as far as may be thought judicious, and if much restlessness and jactitation be present, great advantage will be derived from the exhibition of a moderate dose of *camphor*, *hyoscyamus*, and *James's powder*, in this or any other appropriate form: —

No. 58. ℞ Pulv. Jacobi Veri gr. iij.—v.; Camphoræ rasæ, gr. ij.—iv.; Extr. Hyoscyami gr. iv.—vij.; Syr. Papav. q. s. ut fiant Pilulæ iij. statim sumendæ et h. s. repetend.

No. 59. ℞ Mist. Camphoræ ℥ j.; Liq. Ammon. Acet. ʒ ij.; Spirit. Æther. Nit. ʒ ss.; Tinct. Colchici Semin. ♏ xij.—xx.; Syrup. Papaveris ʒ j. Fiat Haustus, tertiis vel quartis horis capiendus.

196. *f. Derivatives* and *counter-irritants* are useful in many cases, when judiciously prescribed. In the early stage of the disease, and whilst great irritability or delirium is present, they are often prejudicial, excepting simple pediluvia, the semicupium and hip-bath, employed simultaneously with cold applications to the head. Great mischief has arisen from ordering blisters and mustard poultices too early in inflammations, but more particularly in encephalitis, when, instead of deriving the circulation from the inflamed part, they excite the nervous and vascular systems generally, and thus react upon the disease. It is chiefly in the latter stage, when sopor or coma is present, that benefit is derived from them. Some difference of opinion has existed as to the part to which they — particularly blisters — ought to be applied. If the coma be profound, some writers have advocated the application of blisters directly to the scalp. Without denying the possibility of circumstances arising to justify this practice, I believe that they will seldom occur. The most profound sopor, weak action of the carotids, a not remarkably frequent pulse, and a temperature of the head much and permanently below the natural standard, would only induce me to apply blisters to the scalp. When *derivation* can be attempted with safety, — when sopor is present, and morbid sensibility and irritability has nearly disappeared, and depletion has been carried as far as seems judicious, — a large blister to the nape of the neck, or between the shoulders, or over the epigastrium, mustard poultices to the insides of the legs or thighs, or irritating liniments (see the *Liniments* in the Appendix) in the latter situations, will often be used with advantage. The *semicupium*, *warm bath*, or *pediluvia*, are seldom of service when there is much general febrile excitement, particularly in children, unless when used simultaneously with cold affusion on the head. But when the lower parts of the body have their temperature reduced below the natural standard, and when the disease has appeared after suppressed discharges, &c., they are often of service, and may be made more *revulsive* by salt or mustard.

197. *g.* Various remedies have been recommended in the treatment of this disease, in a more particular manner than others. Amongst these, the most generally employed and most beneficial is *calomel*, when given in large and repeated doses, and judiciously combined, and until an impression is made upon the disease, or state of the circulation. In the *meningitis* of children, this practice is particularly requisite, as, without it, but little impression will often be made on the disease; and, with due attention, but little risk will be run of experiencing unpleasant results from it. Where we dread impending exhaustion, the calomel may be combined with small doses of camphor and ammonia, and a less restricted regimen allowed. Marcus recommends strongly very large doses of *nitre*, which may be combined with antimony, or with diuretics; Hedgewisch, the preparations of *mercury* carried to the extent of salivation; Chaussier, the *boracic acid*, very nearly as prescribed in F. 343.; several physicians in Italy and in Switzerland, especially Brera, Tommasini, Peschier, Laennec, &c., large and frequently repeated doses of the *tartarised antimony*, so as to act upon the bowels;

LOEFLER (*Hufeland's Journ. der Pract. Arzneik,* b. iii. p. 694.), free *incisions of the scalp;* and ARETÆUS (*Curat. Acut.* l. i. ch. 1.), CELSUS (l. iii. ch. 18.), CÆLIUS AURELIANUS (p. 30.), and ZACUTUS LUSITANUS (*Med. Pr. Hist.* l. i. p. 85.), scarifications and cupping in the same situation. All these are undoubtedly advantageous, when judiciously prescribed. Besides these, there are remedies which are very generally employed, and which are beneficial in certain states of the disease only: these are, camphor, digitalis, hyoscyamus, opium, &c. In the early stage, *camphor,* unless in very minute doses, is prejudicial; but when sopor or coma is present, when depletion has been duly practised, the heat of the head has subsided, the energies of life are depressed or exhausted, and the symptoms are apparently the consequence of the lost tone of the capillaries of the brain, moderate and frequently repeated doses of this medicine are almost indispensable; particularly in the complications of the disease with typhus, or epidemic fevers, with gout or rheumatism. *Digitalis* as well as *colchicum* are principally required in the early stage, when either of them may be combined with *calomel:* if exhibited subsequently, they should be given with camphor, and their effects carefully watched. Both these medicines may be advantageously combined with aperients or with diuretics. BRERA recommends digitalis as follows in the earlier stages of the disease: —

No. 60. ℞ Pulv. Fol. Digitalis gr. xvj.; Hydrarg. Submur. gr. x.; Pulv. Rad. Glycyrrh. ℈j.; Olei Junip. q. s. M. Fiant Pilulæ viij. Capiat binas tertiis vel quartis horis.

The combination of camphor with colchicum is often of service in the *gouty* and *rheumatic* forms of the disease. I found it recently of much advantage in a severe case of the latter.

198. *Narcotics* ought generally to be avoided; yet there are states of the disease, chiefly in adult and aged subjects, which are benefited by them. When lethargy or coma, or an obvious disposition to either, is present, narcotics are injurious, particularly in cerebritis; but when the membranes are obviously most affected, and the disease presents much of the phrenitic character; when great irritability, mental excitement, or exhausting watchfulness is present, particularly after depletions and other evacuations have been carried as far as seems judicious, and the pulse has been reduced, or become less febrile; a full dose of *hyoscyamus,* or even the preparations of *opium,* particularly the acetate or muriate of *morphine* (F. 315. 674.), the compound tincture of opium (F. 728, 729.), or Battley's sedative liquor, may be exhibited. In cases where the propriety of having recourse to these medicines admits of doubt, they should be combined with moderate or full doses of *camphor* (F. 554. 787.), or the *Spiritus Æther. Sulph. Comp.* (F. 375.)

No. 61. ℞ Camphoræ rasæ gr. j.—iv.; Gum. Acaciæ, Sacchar. Albi, āā ʒss.; Magnes. Carb. ℈j.; Decocti Althææ ℥jss.; Spirit. Æther. Sulph. Comp. Tinct. Hyoscyami, āā ʒj. (vel. Tinct. Opii Comp. (F. 729.) ʒss. M. Fiat Haustus.

199. *B. Treatment of the complicated states.* — There are certain consecutive and complicated forms of the disease which require a somewhat modified treatment. *a.* The *rheumatic* encephalitis, according to J. FRANK, does not admit of cold applications to the head; in other respects, the means of cure do not differ from those already stated. I believe that, in its advanced stage, the application of a blister to the scalp is more likely to be of service in this than in any other form of the disease; and the same remark may be extended to the use of *colchicum* and *camphor* — the latter of which may sometimes be advantageously combined with the tartrate of antimony or James's powder.

200. *b.* In the *arthritic* complication, after general and local depletions, — the latter chiefly on the right hypochondrium, hæmorrhoidal vessels, and insides of the legs, — followed by active purging, stimulating and irritating pediluvia, sinapisms and blisters applied to the lower extremities, and colchicum combined with the sub-carbonates of the fixed alkalies, and diuretics, are chiefly indicated.

201. *c.* When encephalitis occurs in the *course of fevers,* or when it is seated chiefly in the substance of the brain, and assumes a *typhoid* character, from the depressed state of the vital powers, either at the commencement or in consequence of treatment, the infusions or decoctions of *arnica, senega,* or *serpentaria,* have been recommended by the German writers, after depletions have been carried as far as seems prudent. When the disease is thus complicated, depletions should be employed with caution; and those which are local and derivative ought to be preferred, *revulsants* being simultaneously prescribed: cold applications to the head require equal caution. In the early stage of this complication, J. FRANK recommends a combination of *camphor,* cinnabar, and nitre, every two hours. The first of these is amongst the best medicines we possess in every stage of such cases; but it should, in the advanced periods, be exhibited in larger doses than early in the disease; and it may often be advantageously combined with *calomel.* A similar treatment is applicable when the disease appears in the course of *bronchitis* and other pulmonary diseases.

202. *d.* The *erysipelatous* complication of encephalitis often requires a more antiphlogistic and depletory treatment than the typhoid form of the disease; but such is not uniformly the case. I conceive that deep and large incisions into the scalp, particularly over the occiput, as recommended by LOEFLER, would be more applicable to this state of the malady than to any other, especially if there be much tumefaction of the scalp or countenance. When encephalitis follows, or is complicated with *apoplexy,* the treatment differs in no respect from that which has been recommended for the primary form of the disease. Incisions or scarifications of the scalp may be also practised in this complication.

203. *e.* The supervention of encephalitis on inflammations of the digestive mucous surface is not infrequent in children; and in diseases of the *liver* in persons of middle age, or advanced in life. In these cases the treatment is not materially different from that already advised. Local depletions over the region of the liver; full doses of calomel, so as to affect the mouth; cold affusions on the head, particularly in the former state of complication; external and internal revulsants, and diuretics; are generally indicated.

204. *f.* The appearance of the disease after *irritating* and *narcotic poisons,* particularly after opium, aconitum, belladonna, &c., is not infre-

quent. These occasion, first, congestion, and afterwards inflammatory action. In encephalitis from these substances, vascular depletions, cold affusion on the head; emetics, or the introduction of the stomach-pump; camphor or arnica, combined with antimonials or aperients; external derivatives, and active purging; are amongst the chief means of cure.

205. *C. Of the treatment of the more unfavourable and anomalous states of the disease.* — The practitioner, although he will very frequently, or even generally, find the treatment described above successful, may sometimes meet with cases in which the symptoms persist, notwithstanding repeated depletions and the other remedies prescribed: the energies of life being more or less depressed; the pulse becoming very rapid, irregular, trembling; the coma or stupor more profound; and the temperature, even of the head, much diminished. He may or may not have had recourse to derivatives; but, in either case, they may be continued or varied; and camphor, musk, valerian, ammonia, HOFFMANN's anodyne, and other restorative medicines, variously combined, may be exhibited. If the pulsation of the carotids, and temperature of the head, be not in such cases increased; or if they be diminished, and the energies of life be obviously depressed or exhausted, both in the affected organ and throughout the system; the above diffusible stimulants will often be inefficacious. In this case, the infusion of the flowers of arnica, or the infusion of serpentaria, either simply or combined with cinchona; camphor in larger doses, and given occasionally with calomel and small doses of opium; active frictions of the surface and lower extremities with rubefacient liniments; and in some instances, particularly if effusions between the membranes be suspected, with mercurial liniments, or inunction of the scalp; are the principal means that can be adopted. But if, notwithstanding those, the above symptoms continue or increase, — the evacuations being involuntary, and the patient unconscious of them; a vomiting, or rather a pumping up, of whatever is taken into the stomach, with singultus, and an intermitting, trembling pulse, that cannot be distinctly counted, being also present, — are we to continue to give the medicines which we have found inefficacious, thus leaving the patient to his fate? or are we to resort to still more active means? There can surely be no hesitation as to the part which ought to be taken. In a case of this description, consecutive of bronchitis, in a robust man of middle age, who was attended by Mr. FAXON, Dr. BREE, and myself, after depletions and cold applications had been carried as far as it was judged prudent, and blisters were applied on the epigastrium and nape of the neck, without benefit, full doses of calomel and camphor were given, the following medicines prescribed, and their action promoted by the enema terebinth. (F. 151.): —

No. 62. ℞ Mist. Camphoræ rasæ gr. iij.; Ammoniæ Carbon. gr. iv.; Mucilag. Acaciæ q. s. Fiant Pilulæ ij., omni secundâ horâ, cum Haustu sequente, sumendæ.

No. 63. ℞ Mist. Camphoræ ℥j.; Liq. Ammon. Acet. ʒ ijss.; Spirit. Æther. Sulph. Comp. ʒ ss.; Tinct. Capsici ♏ xij.; Syrup. Croci ʒ ss. M.

The following draught was also given, four hours after the exhibition of a large dose of calomel and camphor, with the view of deriving the circulation from the head, and of acting decidedly on the abdominal secretions; and was repeated every hour until three were taken.

No. 64. ℞ Olei Terebinth., Olei Ricini, āā ʒ ij.; Tinct. Capsici ♏ xij.; Olei Cajeput. ♏ vj.; Aquæ Menth. Virid. ℥ jss. M.

The pulse soon afterwards became more distinct and regular, the bloated cast of countenance subsided, and all the symptoms improved. The patient afterwards quickly recovered, and is now in perfect health. At the time the above treatment was suggested by me, his recovery was considered almost impossible. Several years ago, I was consulted by Mr. HARRY COX respecting a very similar case, which was consecutive of erysipelas. In this a similar treatment to that now noticed was adopted, and the patient recovered from an extreme state of danger. This case is published in the twenty-third volume of the *London Medical Repository*. In those states of the disease which are characterised by profound sopor, depression of vital power, and the symptoms above referred to (§ 180. 205.), other means having proved insufficient, a judicious exhibition of the oleum terebinthinæ has very frequently a decidedly beneficial effect, particularly in the typhoid, erysipelatous, and other complications of the disease; and, when suitably prescribed, will generally allay the irritable state of the stomach, with which the worst forms of the malady are often attended even during their advanced stages.

206. The inexperienced practitioner should be aware that the existence of profound sopor or coma does not contra-indicate sanguineous depletions or cold applications to the head, if, conjoined with this state, the temperature of the head be at all increased, or the pulsations of the carotids strong or full. If these evidences of increased action be present, those important parts of the treatment ought not to be omitted; but the depletions should often be moderate or local merely; and, in my opinion, preferably from the scalp of the occiput or nape of the neck, by cupping, or by deep incisions of the former. When the disease is consequent upon suppressed discharges, a derivative intention may be had in view, and the lower extremities, the groins, the vicinity of the anus, &c., may be selected as the situations for depletion. In *traumatic encephalitis*, the fact that the disease either does not appear whilst the wound in the scalp remains open, or is averted by a long-continued discharge from it; and that the worst states of cerebritis often arise after injuries of the head, when the external wound has readily and prematurely healed, furnish a striking indication of the propriety of having recourse to incisions of the scalp in the other forms of the disease, and to issues and setons in the same situation subsequently, when their sequelæ indicate the propriety of having recourse to permanent irritation, with puriform discharge, for their removal.

207. *D. Treatment of the sub-acute and chronic states of encephalitis, particularly in children.* — *a.* One of the most frequent forms of sub-acute inflammation of the brain is observed *in infants*, principally affecting the substance of the organ, and often terminating in dropsy of the ventricles. It is chiefly characterised by want of animation, by slight sopor, indifference to all objects, absence of sound sleep, and a state that is different from waking. The child is dull, but fretful and irri-

table upon being roused or handled. The head generally droops, or reclines on one side; the countenance is usually pallid, but occasionally irregularly flushed; the eyes are dull, rolled about, or turned up; the pupils sometimes dilated, at other times contracted; and the infant often utters a plaintive moaning, and occasionally starts soon after having fallen asleep, as if pained or frightened. The hands are tossed about or raised to the head; the lower extremities alternately extended and drawn up to the abdomen; the head thrown backwards; and occasionally its temperature is slightly increased, whilst the heat of the rest of the body is either natural, or somewhat diminished. This grade of disease may continue for a long time; sometimes fluctuating, at other times passing into either a more acute or more chronic form, or at last terminating in dropsy; the bowels being either relaxed or irregular, but in either case with a morbid and offensive state of the motions. The shades of difference observed in this form of disease are numerous: the pulse is very variable, as well as the appearance of the tongue; which is, however, most frequently red at its point and edges, and white or loaded at its middle and base: in some of the more chronic cases, particularly when the disease is complicated with chronic disorder of the digestive mucous surface, it has what may be called a strawberry appearance, from the number of bright red dots scattered over it. This variety of the disease is often associated with torpor or imperfect function of the liver, with disease of the mucous surface of the stomach or bowels, or with both; and occasionally with bronchitis, especially during the period of dentition, when it often supervenes.

208. *b.* Another variety of this affection is also frequent in infants and children, and seems to be chiefly seated in the arachnoid. Dr. W. NICHOLLS has termed it sensitive erythism of the brain. It is characterised by a morbidly increased sensibility, which distinguishes it from the foregoing variety. The child often cries without any obvious reason; is generally wakeful, lively, but irritable; all the senses, even that of touch, are morbidly acute, particularly the senses of sight and hearing: it frowns, winks its eyes, or closes them upon exposure to light; it sometimes shrieks, clenches its hands with the thumb bent across the palms, tosses backwards its head, and presents many of the symptoms of the preceding form of disease; and not infrequently terminates in effusion; but, more frequently than the foregoing, between the membranes exterior to the hemispheres.

209. *c.* The *Treatment* chiefly consists of leeching behind the ears or on the occiput; frequent scarifications of the gums; the affusion of cold water on the head, or cold sponging; calomel purges, followed by castor oil or other cathartics, and occasionally promoted by terebinthinate enemata; frequent warm semicupia; the use of saline aperients combined with diuretics, and strict attention to diet and regimen, with change of air. After the several active calomel purges have been exhibited, and the evacuations have improved, and the more obvious symptoms are abated, small doses of hydrarg. cum creta may be given at night, either alone or combined with a little of the sub-carb. of soda or potash, and a weak saline mixture through the day, similar to the following, or to F. 440. and 441.: —

No. 65. ℞ Magnesiæ Sulphatis (vel Sodæ Sulph.) ʒij.; Potassæ Sulphatis ʒj.; Aquæ Fœniculi ℥ ivss.; Spirit. Æther. Nit., Vini Antimonii Tart., Spirit. Juniper. Co., āā ʒj.; Syrup. Scillæ ʒij. M. Capiat Infans ʒj.—ʒ iij. ter quaterve quotidiè.

210. When the morbid sensibility or irritability continue notwithstanding the above treatment, and if the child be not very young, small doses of James's powder, and, if that fail of procuring quiet, of the pulv. ipecacuan. comp. may be conjoined with the hydr. cum creta, and given every night; or a little tinct. of hyoscyam., or of the extr. conii, may be added to the above mixture. In the soporose form of the affection, narcotics must be avoided, but the rest of the treatment strictly adhered to. Small doses of camphor and nitrate of potash may also be exhibited, — if in solution, with the spirit. æther. nit., and blisters applied either to the nape of the neck or behind the ears.

211. *E. Treatment of the sequelæ of encephalitis.* — After an attack of this disease, the patient may complain of vertigo, more or less torpor or weakness of the mental powers, cephalalgia, &c.; or of increased sensibility, and marked erythism of the brain and whole nervous system, watchfulness, incapacity for mental exertion, tinnitus aurium, languor, and pain in the limbs, &c. In all such or similar cases, the diet should be carefully restricted to food of easy digestion, in moderate quantity, and consisting chiefly of the farinaceæ. Change of air, easy travelling, avoidance of all mental exertion and anxiety, and attention to the secreting and excreting functions of the abdominal viscera and of the skin, will generally bring about perfect recovery. If these fail; or if the patient have irregular flushings, or increased heat of head; or if the carotids pulsate more strongly than usual; the shower-bath, cold sponging the head night and morning, and wearing the hair closely cut, occasional local depletions, the insertion of a seton in the neck; or keeping out an eruption, in the same situation, with the tartarised antimonial ointment; or blisters kept open behind the ears for some time; may be prescribed.

212. When the more severe sequelæ of the disease are present, — such as cramps, pains, or spasms of the extremities, hebetude or derangement of the mental faculties, obstinate headach, &c.,—we should suspect the existence of a chronic state of the disease, and resort to occasional local depletions, cold affusions, or sponging of the head; followed by issues in the scalp of the occiput, or the inunction of the tartar emetic ointment in this situation; and to the mercurial preparation at bed-time, with cooling and deobstruent aperients on the following morning; and to the other means above recommended. When we apprehend, from the marked character of the above symptoms, or from the paralysed state of particular muscles or parts, that organic lesion has been produced, the means now recommended should be strenuously persisted in; and the mercurial medicines may be pushed to slight salivation, under the favourable circumstances of pure air and mental quiet; after which, gentle tonics, and a more invigorating treatment and regimen, may be cautiously tried.

213. *F. The regimen during the disease* should be strictly antiphlogistic. The patient's drink or beverage may consist of either of the *formulæ*,

No. 590—595. 915. contained in the Appendix; and attention should be paid to the state of the urinary discharge; particularly to the prevention of accumulations of urine in the bladder, which ought to be removed by the catheter whenever any interruption of its evacuation occurs. The *diet*, and regimen generally, should be as carefully regulated during convalescence, as in the progress of the disease; and attention ought to directed no less to the mental occupations, and moral emotions, than to the natural functions, and physical employments. Care should be taken not to carry abstinence too far in the meningitis or encephalitis of infants or children, particularly after large sanguineous depletions and doses of calomel have been employed. The exhaustion arising from too great abstinence, and from the treatment, will often simulate effusion into the ventricles; and be mistaken for it, if the history of the case be not carefully attended to in connection with existing symptoms.

214. Brain — Softening of the. — *Ramollissement*. Classif. Class, Order (*Author*, see *Preface*).—I have considered this change, apart from those proceeding from inflammation, although it is frequently a consequence of inflammatory action, occurring either in an acute, sub-acute, or chronic form, and characterised by deficient vital power; chiefly because I agree with MM. Rostan, Recamier, and others, in considering that it occasionally is unconnected with inflammation, particularly in aged persons.

215. Symptoms.—This disease takes place slowly, and we may distinguish in it two stages, the recognition of which is of much importance in the diagnosis, inasmuch as when the first period does not exist, or when the physician cannot obtain a satisfactory knowledge of it, it is difficult to determine the particular kind of disease present. 1st, *The first period*.—*A. Direct symptoms*, *a. of non-inflammatory softening*. A continued, and more or less severe, pain in the head is generally complained of. To some, the existence of pain may appear pathognomonic of inflammation; but, as M. Rostan has justly said, this is an inference not borne out by close observation; for pains frequently occur, of a most severe description, unconnected with any form of increased vascular action, or capillary injection. Cephalalgia is, however, not always present. At this period, vertigo is oftener complained of, and there is generally a more or less marked diminution of the intellectual and moral faculties. The perceptions, attention, judgment, memory, and imagination, are more or less enfeebled; and the patient sinks into a species of senile mental alienation. Sometimes the mental disturbance is partial or slight, owing to the seat and limited extent of the softening. There are observed, moreover, slowness in the answers; some degree of embarrassment in the motions of the tongue; dejection and sadness of spirits; hypochondriasis, or an extreme indifference as to events; great inclination to sleep, with prickings, twitchings, and numbness in the limbs; and much difficulty of laying hold of objects, particularly those of small size. The sensibility is generally diminished; vision is often affected, being less distinct than usual, or partially or altogether abolished. It very rarely happens, that unequal dilatation of the pupils, or strabismus, occurs. The sense of hearing is generally impaired. These are the chief symptoms of *non-inflammatory* softening of the brain.

216. *b.* If the *softening* proceeds from *inflammatory action*, this period is more acute, of longer duration, and presents also certain important distinctions. The pain in the head is then more acute and sharp; the answers are abrupt and quick, and there is frequently delirium: the sensibility of the limbs is often increased, and the patient complains of pain in them, with stiffness, contractions, and cramps. This affection of the limbs may be mistaken for rheumatism, but is to be distinguished from it by the existence of cerebral symptoms, and the absence of increased heat, redness, or tumefaction. The senses evince excessive sensibility, and cannot tolerate their natural stimuli. (Rostan.)

217. *B. Indirect symptoms.*—*a.* The functions of organic life do not present undeviating symptoms, and assist but little the diagnosis; the appetite may be diminished, the thirst somewhat increased, and digestion more or less disturbed, and the mouth and tongue white and clammy. Sometimes there is nausea, or even vomiting, with epigastric tenderness; and there may be either constipation or slight diarrhœa; micturition is more or less difficult, or involuntary; or all these symptoms may be absent. The following are more constant in this non-inflammatory form of the disease: the pulse is slower and feebler than natural, a symptom which is not observed in inflammatory softening of the brain; the skin is pale, its temperature is lower than natural, and the respiration slow and gentle. *b.* In *inflammatory softening*, the pulse is strong, full, or frequent; skin hot; and there is much thirst, with many of the symptoms described in the *section* on *Cerebritis* (§ 164.), but generally in a sub-acute or chronic and slight form. Thus far, the symptoms do not seem very urgent; and they may be so slight, or so obscure, that the patient is not induced to have recourse to medical aid, or the physician overlooks the nature of his ailments.

218. 2d, *Second period.*—*A. Direct symptoms.* *a.* The patient now loses the use of some limb, or even one half of the body, either gradually or suddenly, but generally the latter. The greater part of the time his intelligence is but little disturbed, but he answers with extreme slowness, and is often incapable of making himself understood, excepting by the aid of painful gesticulation. In certain cases, either complete coma supervenes on the paralysis, or both come on simultaneously. If the latter, the patient often regains his recollection in a day or two afterwards. This change seems attributable to temporary congestion of the brain. The symptoms, particularly the coma and paralysis, are increased, the mental faculties and the powers of sense become entirely abolished, and the patient sinks under the most complete coma. (Rostan.)

219. *b.* In the *inflammatory softening*, in the place of paralysis, there exist pains, more or less violent, shootings in the limbs, with contractions, cramps, or convulsions, and severe headach. In either the inflammatory or non-inflammatory form of the disease, when the patient complains of pain in the head, and is asked its situation, he carries the unaffected hand slowly to his head, and indicates generally the side opposite to that

paralysed. In *encephalitis*, there is generally delirium; in the *non-inflammatory* form of *softening*, the intellectual faculties are enfeebled, or much weakened; the countenance is generally pale, colourless, or sometimes even sunk; whereas in *inflammatory softening* it is red, or more or less injected, or even tumid.

220. *B. Indirect symptoms.* — *a.* In this second stage of the disease, the organic functions are more or less affected: there is no appetite; the teeth and gums are dry, the tongue rough, brown, blackish, chopped or traversed by small fissures: deglutition is difficult: sometimes there is vomiting, first of the ingesta, and afterwards of bile: all the excretions are involuntary; frequently there is constipation: respiration is laboured, and at last stertorous; the pulse feeble, frequently irregular or unequal, or even intermittent, and the skin is cold. *b.* In *inflammatory softening* there is great thirst, redness of the tongue, sensibility of the epigastrium and abdomen, hot skin, a strong and frequent pulse, &c. (See § 170.)

221. The second period may be of longer or shorter *duration*. The morbid phenomena often continue stationary for a considerable period, and then make rapid progress; at other times the progress is slight, but constant; in some cases it is constant and remarkable. This disease very rarely retrogrades or evinces much amelioration; its progress is essentially continued and increasing. The *anatomical characters* of softening have been already fully described (§ 70, *et seq.*). It may be stated in general, that when it is the result of inflammatory action, as it most frequently is, 1st, The colour of the softened part is, more or less, deeper than natural, or of a rose tint; 2d, It contained a certain quantity of pus, sometimes infiltrated through the softened tissue; and, 3d, Febrile symptoms have existed previously to the death of the patient.

222. Treatment. — It is unnecessary to add any thing to what has been already advanced respecting the treatment of the inflammatory states of softening, which are essentially the consequence of partial cerebritis (see § 191, *et seq.*). When, however, the disease does not present an inflammatory character, it becomes necessary not only to enjoin abstinence from all debilitating means, but from the commencement to apply rubefacients, to throw irritants into the great intestines (see Enem. F. 141. 150.), and to have recourse to tonics, aromatics. &c., of which the sulphates of zinc, iron, or quinine, in small doses, with sulphuric acid, or the less heating astringent tonics belonging to the vegetable kingdom, are the most eligible; preserving, at the same time, a regular state of the alvine secretions and evacuations, and of the other digestive functions.

223. *Regimen.* — The gently tonic, chalybeate, and aperient mineral waters are of service in the non-inflammatory form of the disease; whilst those only which are aperient and deobstruent should be ventured upon in its inflammatory states, when they may be tried and varied; local evacuations, revulsives, particularly setons, issues, &c., being kept discharging at the same time. In both forms of the disease, gentle travelling, and change of air, and agreeable and quiet amusement, without undue mental excitement of any kind, will be of much service. M. Rostan's injunctions under this head may be summed up as follows: — Those alimentary and medicinal substances which exert a strong and speedy action on the encephalon, should be strictly shunned. Wine, spirits, coffee, and spices, are of this number. Excess at the table is dangerous. The diet should be mild and moderate, and the food easy of digestion, but not too nutritious. The impression of cold air on the head may be favourable: sudden passage into a heated place must be avoided: the patient should inhabit a cool situation. Whatever, by compressing the limbs or the organs contained in cavities, may favour cerebral congestion, must be rigidly proscribed. Warm, as well as cold bathing should be interdicted: tepid bathing alone may be permitted, although with much caution. Cold lotions to the head are advantageous in the inflammatory form of the disease, provided we do not permit reaction to be established; at the same time pediluvia containing mustard may be prescribed. The ordinary excretions should be kept up; but sexual indulgence, too violent exercise, strong emotions, long study, and watching, should be carefully avoided. The age, strength, constitution, habits, and state of the patient, and the character of the symptoms, must modify these precepts.

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BRONCHI, Diseases of the. Syn. Βρόνχος, Gr. *Bronchus*, *Bronchia*, Lat. *Bronche*, Fr. *Die Luftröhrenäste*, Ger. *Bronchi*, Ital. *Air-passages*, *Air-tubes*, Eng.

1. Bronchi and Air-tubes — *their Alterations.* Under this head, the alterations of structure usually found in the air-tubes, from the larynx to the smallest subdivisions of the bronchi will be first considered, and subsequently the history of such of them as are more immediately seated in the bronchi, and are not treated under distinct heads, where some of them are placed, owing to their specific nature, and their relations to other parts.

2. 1. Alterations of Structure in the Bronchi. — As the same lesions are found in the larynx and trachea, as in the bronchi, although certain of them are more frequent in one part than in another, no particular distinction depending on locality merely will be made, in order that repetitions may be avoided.

3. i. Alterations of the Mucous Membrane of the Air-passages. — These are the same in kind from the glottis to the air-cells, whether the vascularity, the structure, or the secretions of this membrane, be individually or collectively changed. *A. Passive or simple congestion* of this surface is not unfrequently found after death; and there is every reason to believe that it may take place during life, or at the moment of death, or even be a *post mortem* change. When occurring during life, it is most frequently met with in the debilitated, and when the return of blood to the left side of the heart has been impeded. Simple congestion of this membrane may be either partial or general. When *general*, and at the same time suddenly and intensely formed, it may terminate life with all the symptoms of asphyxy. (See Congestion of the Bronchi.) In a slighter form it accompanies various diseases, particularly the febrile exanthemata; but it is seldom found in a chronic form. Congestion of this membrane presents various depths of shade, varying from a dirty pale red, or a brick red, to a brownish or purplish hue; being sometimes equally deep throughout, in others of a different shade in different situations.

4. *B. Inflammatory injection*, or active congestion of the bronchial surface is generally *partial*, or affects one part of the air-passages more than another. It is also of a livelier colour, and is usually attended with some of the changes hereafter to be noticed. Partial or inflammatory redness of the mucous membrane is very much more common than general congestion. It may be limited to the trachea and larynx, whilst the bronchi are pale; and in this case it may be confined to one side of the tube. M. Andral has seen it cease abruptly at the medium line, particularly when one lung was affected; and then the inflamed side of the trachea has corresponded with the diseased lung. The redness may also be confined to the large bronchi, the mucous surface of the passages above and below its seat being pale; or it may be limited to the smaller bronchi, where it often occasions great dyspnœa and fever, with little or no cough. According to M. Broussais, the bronchi of the upper lobes are most frequently congested and inflamed. Congestion and inflammatory injection of the bronchial mucous membrane, although very often connected with diseases of the substance of the lungs, are not necessarily dependent on any of them; for this membrane may be pale from the glottis downwards in cases of acute, and still more in chronic, pneumonia. The same obtains in respect of tubercles, previously to their softening. In many cases, however, where tubercles exist in the lungs, the surface of the smaller bronchi are more or less inflamed or congested; and when the tubercles have advanced to softening, the bronchi nearest them are almost always red. Where tubercular excavations exist, the redness is still more marked and extensive, sometimes proceeding along the trachea to the larynx: bronchitis thus supervening to tubercular phthisis. In these and various other diseases, the inflammatory state of the mucous surface commences in the smaller ramifications, and spreads upwards to the glottis. But in other maladies, particularly those which first affect the Schneiderian membrane, throat, fauces, pharynx, &c., the injection of the bronchial surface is chiefly an extension of these; inflammatory action more frequently originating in some one of these situations, and extending itself more or less rapidly, according to the state of the patient, along the surface of the larynx, trachea, and large bronchi successively, until it at last reaches the minute bronchi, or even the air-cells and structure of the lungs. This is the usual direction in which inflammation of the mucous membrane of the air-passages commences and extends itself; but most frequently without reaching the smaller bronchial ramifications, and pulmonary parenchyma.

5. *C. Thickening of the mucous membrane of the air-passages* is a very common lesion, arising, 1st, from its congested or injected state; and, 2d, from its increased nutrition or hypertrophy. *a.* The former is most frequently observed in the larynx and small bronchi: it is sometimes found in children about the margin of the glottis, giving rise to a form of croup. *b.* True thickening, or hypertrophy of this membrane, occurs in various situations, occasioning very different phenomena accordingly, particularly in those who had been affected with chronic coughs. This form of thickening may extend throughout the larynx, or may be limited to the epiglottis, to the entrance of the glottis, to the chordæ vocales, or to the ventricles.

In the trachea it may occasion no marked symptom; but in the bronchi, particularly the smaller, it gives rise to sensible alterations of the sound of the pulmonary expansion. It may, when extensive, very materially impede the changes produced by respiration on the blood. Hypertrophy of this membrane may also be confined to a circumscribed point, forming thus a tumour rising above the surrounding surface. This form of thickening may assume a nearly cauliflower appearance, from its exuberance. These excrescences have been found in the larynx by MM. ANDRAL and FERRUS.

6. The *mucous follicles* may be enlarged independently of the membrane in which they are seated. When this is the case, a number of round granular bodies, of either a white, red, or dark brown colour, are found on the internal surface of the membrane, surrounded by two coloured circles—one round the centre, the other round the base. M. ANDRAL thinks that they have often been mistaken for tubercles, and for the variolous eruption.

7. C. *Other alterations of structure in the respiratory mucous membrane.* — *a. Atrophy* is said by ANDRAL sometimes to be observed in this membrane. *b. Softening* is much more frequent; and is most common in the larynx, especially in the situation of the chordæ vocales and ventricles, where it is sometimes very remarkable, and has been the only change of these parts observed in persons who had either lost their voice or been hoarse long before death. *c. Ulceration* is not infrequently found in this membrane. Ulcers may be seated in any part of the air-passages, but are more common in the *larynx* than in the trachea or bronchi. They rarely, however, occur in the larynx, without tubercular ulceration existing also in the substance of the lungs. They occasion various modifications of the voice, according to the parts of the larynx in which they are situated; being found in every point of its internal surface. Their size and number vary exceedingly. Sometimes only one very small ulcer is found, the rest of the larynx being in all other respects quite natural. In other cases, this part is nearly destroyed by numerous ulcers of various shapes and sizes; and in some cases, one large ulcer extends over one half or more of the larynx. Ulcers, when seated in the *trachea*, are chiefly found in its posterior or membranous part. M. ANDRAL states, that in some cases they are confined to one side of the trachea, which invariably corresponds to the diseased lung; or, if both lungs be diseased, to that which is most affected. Ulcers are not so frequent in the *bronchi* as in the larynx, but more so than in the trachea.

8. Ulcers in the internal surface of the air-passages sometimes extend no deeper than the cellular tissue connecting the mucous membrane to the subjacent parts. In this case the connecting tissue is much thickened at the bottom of the ulcer. But they frequently proceed deeper, destroying successively the different tissues, until the parietes of the tube are at last perforated, and a fistulous opening is formed between it and some neighbouring organ or part, as the œsophagus, aorta, parenchyma of the lungs, large blood-vessels, the pleural cavity, &c., or even the external surface; forming, in this last case, a direct communication between its interior and the external air. When a fistulous opening extends into an excavation in the parenchyma of the lungs, it is difficult to determine whether it produced, or was itself occasioned by, the excavation. When it is connected with a cavity arising from the liquefaction of tubercular masses, there can seldom be much difficulty in determining the precedency; but every cavity found in the lungs has not this origin. There can be no doubt that ulcers perforating a bronchial tube may excite inflammation of the substance of the lungs, and occasion either small abscesses, or ulcerations, which enlarge into considerable excavations. But, in the majority of cases, excavations communicating with the bronchi arise from the softening of tubercles; the bronchi being perforated from without inwards, instead of from within outwards, as in the case of ulceration commencing in their mucous surface. The bronchi or trachea may be also perforated from without inwards, by aneurisms, &c. of the aorta, and not infrequently by ulceration commencing in the œsophagus and extending through the membranous part of the trachea; an instance of which I lately had an opportunity of seeing in a patient of my friend, Mr. BYAM. Suppurated bronchial glands may also perforate the bronchi which they surround, and pour their contents into them. A similar result may likewise occur from purulent collections, hydatid formations, &c. of adjoining parts, as of the thyroid gland; instances of which are recorded by PORTAL and ANDRAL.

9. D. *Alterations of the secretions of the air-tubes.* — M. ANDRAL has very justly stated that alterations may occur, 1st, in the gaseous secretion; 2d, in the perspiratory exhalation; and, 3d, in the mucous secretion. *a.* Changes of the *gaseous exhalations* are but little understood, and are more matters of inference than of demonstration. There can be no doubt, however, that not only in various diseases, but also in certain states of the system and of the atmosphere, a very material alteration occurs in the proportions of the different gases naturally exhaled by the mucous surface of the lungs. That the successive changes in the system, certain conditions of temperature and of the air, different states of vital energy, and the constitutional differences in the various races of our species, modify very materially the quantity of carbonic acid gas and of azote exhaled from the lungs, may be considered amongst the surest established facts in physiology. (See my *Notes, &c.* p. 626.) Such being the case, it may reasonably be inferred that marked alterations of the gaseous exhalations also take place in disease.

10. *b.* The *perspiratory exhalations* evidently undergo changes in disease; but their nature and extent are but little known. The vapour exhaled from the respiratory mucous surface very probably may, when excessive, be condensed into a liquid state, and increase the watery fluid sometimes discharged from the lungs. M. ALIBERT states that he has seen, in certain diseases of the skin in which the cutaneous transpiration is suppressed, the pulmonary vapour issuing like steam from the chest, and descending again like an abundant dew. M. ANDRAL adduces, in his *Clinique Médicale*, the case of a person who suddenly discharged, whilst suffering from hydrothorax, an enormous quantity of a serous fluid from the bronchi, at the same time that the fluid which had been effused in the chest was absorbed.

11. *c.* Alterations *of the mucous secretion* of the bronchi have been successfully studied by a number of modern pathologists, but more particularly by M. ANDRAL. This secretion is modified both in its quantity and quality. It is often very greatly increased in acute and chronic affections, particularly those immediately affecting the respiratory passages; under which heads the principal changes of this secretion, with the different states and stages of disease, are described. The quantity of the mucous secretion may be so excessive as to nearly fill up the bronchi, trachea, and larynx, and to suffocate the patient. This sometimes occurs in adults; but, I believe, still more frequently in children, forming in one of its states a species of croup intermediate between true croup and bronchitis; and, in another state, the disease hereafter described as *asthenic bronchitis.* M. BLAUD considers the former, or that seated chiefly in the large bronchi, in which the secretion is consistent and glairy, a "form of croup, and calls it *croup myxagène.*" This excessive secretion of mucus is sometimes unattended by any alteration of the air-passages. The mucous secretion may become so viscid as to adhere to the sides of the bronchi; where it may accumulate so as to occasion a fatal dyspnœa, by preventing the passage of the air. In other cases, the mucus is transformed into a puriform fluid; sometimes without any trace of ulceration, or even of redness, in any of the bronchi; the alteration of the secretion being independent of any perceptible change of structure. More commonly, however, patches, streaks, or points of inflammatory injection of the mucous membrane accompany this state of secretion.

12. *d. Membraniform concretions,* or false membranes, form more frequently upon the internal surface of the air-passages than in any other mucous canal. Some pathologists have supposed them to be consequent on the most intense states of inflammatory action in mucous membranes; but this is evidently not the case: they are rather a result of a certain state of the system, probably connected with excess of the albuminous constituent in the blood, together with a disposition in the inflamed vessels to secrete it. (See art. CROUP.) These membranes are generally unorganised, and vary in thickness and consistence in different parts as well as in different cases. According to SCHWILGUÉ, they consist of albumen, with a small portion of carbonate of soda and sulphate of lime. M. BRETONNEAU has detected fibrine in them. They may exist in patches, or in continuous layers, or in perfect tubes; and extend from the larynx, where they usually commence, to the minute divisions of the bronchi. They rarely originate in this latter situation, and advance upwards; but they often commence in the pharynx, fauces, &c., and extend through the glottis, and down the trachea and bronchi. They are most frequently met with in children from two years of age to puberty; and are not confined to, although most frequent in, acute diseases. In some cases they assume, in children, a chronic character, but only when confined to the trachea; whilst a chronic state is most common in adults, when they are usually formed in the bronchi. When, however, they occur in the larynx, the tumefaction of the subjacent membrane, the spasms of the muscles, and their own thickness, often give rise to an acute or fatal disease. When seated in many of the small bronchi, they may occasion asphyxy by interrupting the changes produced by the air on the blood. It is probable that *fibrinous* or *polypous* concretions may sometimes form in the bronchi, from the coagulation of a portion of blood exhaled from its mucous surface. LAENNEC has described (*Rév. Méd.* 1824, t. i. p. 384.) a case which appears to be of this description. Such formations differ from the albuminous exudations, in their containing much fibrine, and being of a darker colour than the latter.

13. *e. Earthy or calcareous concretions* occasionally are found in the air-passages, and are sometimes coughed up. They consist chiefly of phosphate of lime; and are formed either in the substance of the lungs, and escape into the bronchi, or in the latter; but more probably in the air-cells. They have also been found impacted in the ventricles of the larynx. The cause of their formation is not well understood. They have been ascribed to chronic irritation of the small bronchi and air-cells; but this source is by no means well established. I have met with them in gouty persons, by whom particularly they are often expectorated during life, recovery generally taking place. *Hydatids* have also been found in the air-tubes. In some cases they may have been developed in this situation; but they much oftener escape into it from contiguous parts.

14. *f. Hæmorrhage from the respiratory surfaces* are amongst the most frequent changes to which it is subject. In the greatest number of cases of *hæmoptysis,* the blood is exuded without any ulceration or breach of surface: a slight redness of the mucous membrane being the only change that can be detected. When the hæmorrhage occurs in the smaller bronchi, the blood sometimes accumulates and coagulates in them; imparting a blackish or brownish black appearance to the lobules, and constituting the *pulmonary apoplexy* of LAENNEC. The occurrence of hæmorrhage into the parenchyma of the lungs is, however, more strictly deserving of this appellation. The extravasation and coagulation of blood in the small bronchi, giving to portions of the lung a blackish and indurated appearance, are most commonly, but not always, found in persons who have expectorated blood, or died from an attack of hæmoptysis; and are most frequent in those cases which supervene in the progress of diseases of the heart. M. ANDRAL considers, however, that the hæmoptysis is not from those sources which have been called apoplectic; but from a larger extent of mucous surface, and from larger tubes. (See art. LUNGS — *Alterations of,* and *Hæmorrhage from.*)

15. ii. ALTERATIONS OF THE OTHER STRUCTURES COMPOSING THE AIR-TUBES. — *A. The fibrous and muscular tissues* of the air-passages experience various changes. *a.* The *fibrous* structure of the bronchi are sometimes found either softened or hypertrophied. The thyro-arytenoid ligament is occasionally softened. It has then lost its brilliant colour, become opaque, or even changed into a cellular-like tissue, or an unorganised pulpy substance, leaving the thyro-arytenoid muscle exposed. In this case the voice is remarkably altered. When the fibrous tissue is hypertrophied, increase of thickness is the chief appearance. (ANDRAL.) *b.* The *muscular* structure, as it exists in the trachea, &c., may be either atrophied

or hypertrophied; it may also be softened and destroyed partially or in points by ulceration (§ 7, 8.). But it is chiefly where this structure assumes a different state and function, as in the larynx, that it undergoes marked alterations, giving rise to the most formidable and fatal diseases. The muscles of the larynx are, in some of those cases, softened, more or less atrophied, or even altogether destroyed; and, in others, infiltrated with either purulent or tubercular matter. (BOUILLAUD, ANDRAL, and others.) M. ANDRAL states, that he has more than once observed, on examining the larynx of persons who had been long completely without voice, the thyro-arytenoid muscle either remarkably atrophied, or its fibres infiltrated by different morbid secretions; this being the only lesion that could be detected.

16. *B. The cartilaginous structures of the air-passages* are most frequently diseased in the larynx. The cartilage of the epiglottis sometimes loses its natural form: it is scarcely ever ossified; but it is occasionally somewhat indurated, so that it imperfectly protects the opening of the larynx. It is not infrequently destroyed altogether by *ulceration*, commencing either in itself, or in the tissues enveloping it. Similar changes to these sometimes take place in the other cartilages of the larynx. Ulceration of these cartilages may be superficial only; or it may destroy more or less of their structure. It generally commences in the soft parts covering them; but in some cases, particularly of constitutional taint, there is reason to suppose that it originates in inflammation of the cartilages themselves, terminating in the ulcerative process, and the formation of purulent matter in the soft parts adjoining, which escapes by a fistulous opening, generally through the mucous surface into the larynx, and rarely externally. Ulceration may also commence in the articulations of the cartilages; filling them with pus, and destroying their ligaments and articulating surfaces. The thyroid and cricoid cartilages are naturally ossified in old age; and in consequence of disease, in earlier life. M. ANDRAL states, that the arytenoid cartilages have never been ossified. The *rings of the trachea* are sometimes ossified, but seldom or ever otherwise altered. The cartilages of the bronchi are often hypertrophied, becoming more apparent, and forming more complete rings, than natural. They are also sometimes ossified. MM. REYNAUD and ANDRAL found the ultimate ramifications of the bronchi changed into osseous spiculæ, with minute canals (the cavities of the bronchi) running through them, in very old subjects. M. ANDRAL states, that the bronchial cartilages may become so brittle from disease, as to break into fragments, project into the canal of the bronchi, or become altogether detached, and be ultimately expectorated.

17. *C.* The *cellular tissue* connecting the above structures is often the seat of disease. In the *larynx*, it is very frequently the seat of inflammation and congestion; and, in consequence of a chronic state of inflammatory action, it sometimes becomes indurated and thickened; diminishing remarkably the calibre of the glottis, impeding the action of the muscles, and affecting the form and movements of the epiglottis. This tissue, in the situation of the larynx and epiglottis, is occasionally infiltrated with *serum*, which, when considerable, constitutes the *œdema of the glottis*, first accurately described by BAYLE. The infiltration may distend the folds of mucous membrane, surrounding the rima of the glottis, so as to obstruct more or less the passage through it. This change is generally consecutive of inflammation of the mucous membrane of the larynx, or of chronic affections of this organ. In some cases it is very chronic; in others very acute, quickly producing asphyxy. Instances of this latter form are to be found in the sixth volume of the *Archives Générale de Médicine*, and twenty-second volume of the *London Medical Repository*. *Purulent matter* is sometimes found in the cellular tissue of the air-vessels, either in the state of small abscesses, or infiltrating it to a greater or less extent; and either in the ventricles of the larynx, or in any other situation in the course of the air-passages. *Tubercular matter* has also been found in various parts of this tissue. Different kinds of *tumours* occasionally compress the nerves supplying the air-vessels, and give rise to symptoms similar to those caused by disease of their parietes. They are sometimes formed in the larynx, or in its immediate vicinity, occasioning more or less complete occlusion of the glottis. M. FERRUS has recorded a case where this result followed the developement of two fungous tumours in the larynx (*Archives Génér*. Août 1824.). Several writers have made mention of a *varicose state* of the veins of the air-passages amongst the causes of hæmoptysis; but M. ANDRAL states that he has never met with this appearance in his numerous post mortem inspections.

18. iii. ALTERATIONS OF THE SIZE OR CALIBRE OF THE AIR-VESSELS.—The changes already described very often cause marked change in the air-tubes, either diminishing or increasing their calibre. *A. Diminution of their canals* are occasioned, *a.* by the formation of false membranes, chiefly in the larynx and trachea of children, and in the bronchi of adults: *b.* by thickening of the mucous membrane; occurring principally in the glottis and bronchi: *c.* by infiltrations of fluids into the sub-mucous cellular tissue, chiefly in the larynx and vicinity: *d.* by various substances formed in some part of these tubes, such as hydatids, coagula of blood, concrete mucus, &c.: *e.* by compression by some tumour situated externally to some portion of them, as by the thyroid gland, an aneurismal tumour, or enlarged bronchial glands. *f.* Lastly, there is every reason to conclude, that diminution or constriction of some part of these passages very often arises, although seldom in so permanent a manner as to be observed after death, from spastic contraction of the fibres or muscles belonging to them; particularly when foreign bodies escape into the trachea, or when it, the larynx, and even the bronchi, are irritated by morbid productions — the larynx more especially.

19. *B. Dilatation of the bronchi* was first described by LAENNEC, and afterwards illustrated by ANDRAL and others. It is most frequently observed in the smaller ramifications; and may be so great as to be mistaken for tuberculous excavations. *a.* In some cases, the bronchi may be uniformly dilated throughout one or more of their ramifications, some of those which could not naturally receive a fine probe, having attained the size of a goose-quill; and, in some instances, even admitting the finger. These dilated branches are

sometimes visible on the surface of the lung, where they terminate abruptly. They occasionally also terminate, particularly near the top of the lung, in an indurated black portion of its substance, or in a cartilaginous mass, or in a calcareous concretion, either exterior or interior to the dilated bronchi. *b*. In other cases, the dilatation is limited to a particular point of the tube, and has the appearance of an excavated cavity in the substance of the lung, for which it may be mistaken, especially when it is met with in the upper lobe. The size of cavities arising from this species of dilatation varies from that of a hemp-seed to that of an egg. Several of these may co-exist. When they are placed near each other, they form, by their communication, a complicated sinus filled with puriform mucus, and closely resemble some kinds of tuberculous excavations. *c*. Occasionally they present a third form, consisting of a succession of dilatations, between each of which the bronchus recovers its natural diameter, the walls of the dilated portion being generally thin and transparent. One lung may contain a number of these dilatations. *d*. The *parietes* of the dilated bronchi are, in some cases, hypertrophied, or more fully developed than in the natural state; in other cases they are reduced to a delicate membrane, presenting neither fibrous nor cartilaginous tissue. (ANDRAL.) The dilated portions generally contain much mucus, or a puriform mucus.

20. These changes of the bronchi are seldom found, unless in persons who had suffered attacks of chronic bronchitis. They are most common in persons of middle or advanced age. But they are also sometimes met with in children who had died of hooping-cough, particularly in its more chronic states, and when complicated with bronchitis. I have occasionally found them in this class of subjects; but only consequent upon this disease. Dilatations of the bronchi, unless when very considerable, seldom occasion any change of the parenchyma of the lungs, beyond compressing and condensing it: they are frequently associated with either grey or dark induration of the adjoining pulmonary substance. (See CHRONIC BRONCHITIS, § 52. 61.).

II. CONGESTION OF THE BRONCHI. CLASSIF. I. CLASS, III. ORDER (*Author*).

21. DEFIN. *Urgent continued dyspnœa; little or no cough, and no expectoration; with an anxious, pale, or livid countenance.* — This affection is not often seen in a primary, severe, and general form; but it is very common in more slight and partial states; and as an attendant on typhoid, malignant, and pestilential diseases, and on exanthematous fevers, especially measles, scarlatina, and small pox, either shortly before the breaking out, or upon the premature disappearance of the eruption, when it often assumes a very general and severe form: and it not infrequently, in slighter grades, ushers in other diseases of the bronchi, particularly hæmorrhage, bronchitis, humoral asthma, &c. General idiopathic congestion of the bronchi, to such an extent and degree as to destroy life, although rare, is sometimes met with. Several cases have been recorded of persons who, without any apparent cause, were seized with urgent dyspnœa, increasing until it terminated in death; and, on dissection, the only morbid appearance observed was general congestion of blood in the capillary vessels of the mucous and sub-mucous respiratory tissues. (*See* § 3. *for a description of its anatomical characters.*)

22. The *symptoms* of this affection have not been sufficiently investigated; but they may be stated to consist of continued dyspnœa, more or less urgent; sometimes fever, little or no cough, and no expectoration; the sibillous or sonorous rhonchus in the large tubes, and absence of the respiratory murmur over the chest; diminished resonance on percussion; anxious, pale, bloated, or slightly livid countenance; purplish tint of the lips and nails of the fingers; anhelation, &c. When the congestion take place in the course of fibrile or exanthematous diseases, in addition to these, the pulse becomes very quick, small, irregular, or intermittent, and the oppression at the chest extreme.

23. The *causes* of these congestions are not well known. They appear, however, to be most frequently occasioned by the inhalation of poisonous gases or effluvia; by close, overheated, and crowded apartments; by the ingestion of sedative or narcotic substances, or indigestible or poisonous animal or vegetable matters; by inordinate distension or oppletion of the stomach; and by the transition or metastasis of other diseases, or by their determination to the bronchial surface in a more especial manner, as in the instances above referred to (§ 21.). When this affection proceeds from poisonous or indigestible substances, and not infrequently also when it arises from other causes, it is evidently associated with more or less congestion of the substance of the lungs. It often precedes other pulmonary complaints, as hæmorrhage, and that modification of asthma, called dry catarrh by LAENNEC. Congestion of the bronchi sometimes also occurs in the progress of several diseases of the heart attended with obstructed or impeded circulation through its cavities, particularly those of its left side; and is often one of those changes which supervene in the advanced stages of several acute diseases, especially the exanthemata, and to which death is more immediately owing. (See § 21.)

24. The TREATMENT must depend upon the state of the vital energies at the time, upon the nature of the causes to which the congestion is owing, and on the evidence of existing general plethora. The state of the pulse, in respect of frequency and fulness, will indicate the degree of activity characterising the attack; but generally, when the congestion is considerable, the changes which take place in the lungs during respiration being impeded, the vital energies become proportionately reduced, and the pulse weak, quick, and small. In the majority of cases, it will be necessary, notwithstanding, to abstract blood either by venæsection or cupping; and if the depression of vital power be urgent, to exhibit simultaneously stimulants by the mouth, and in enemata; to emdloy frictions with irritating liniments (see F. 305. 308. 311.), and revulsants, such as sinapisms, blisters, mustard pediluvia, &c.; and to inhale, at brief intervals, and for a very short time, stimulating vapours, particularly those of ammonia, camphor, aromatic vinegar, &c., with the view of exciting the nerves of the bronchi, and thereby removing the distension of the capillaries, and accelerating the circulation through them. When,

however, the patient, in addition to the symptoms indicating congestion, complains of a sense of heat, trickling, &c. in the course of the trachea, or under the sternum; and if the pulse retains its volume, and still more especially if it be sharp, full, or rebounding; we should infer that the fulness of the bronchial vessels is of an active description and most probably amounts to determination of blood; and, possibly, constitutes the early stage of hæmorrhage or of inflammation. In cases of this description, full blood-letting, either generally or locally, or both; and afterwards, counter-irritation and revulsion, irritating cathartic injections, the strict avoidance of internal stimuli, and the antiphlogistic regimen; must be prescribed.

25. In every case a strict reference should be had to the cause, associated circumstances, and the complications of the attack, and the treatment should be varied accordingly. When it seems to have been induced, or aggravated, by hurtful substances taken into the stomach, the exhibition of emetics, particularly No. 402. in the Appendix, ought not to be omitted; and, if they fail of operating, the stomach-pump should be used. The bronchial congestion preceding, accompanying or consequent on the eruptive fevers, is to be combated by cupping, revulsants, rubefacients, stimulating frictions of the surface, and by emetics.

III. Hæmorrhage from the Bronchi. — *Hæmoptysis* (from αἷμα, blood, and πτύσις, sputum) frequently occurs, and often consists, as already stated (§ 14.), of a simple exhalation from the mucous surface. It is seldom, however, owing merely to the pathological state of the bronchi; but is either connected with some change in the substance of the lungs, or with impeded circulation through the heart; although the bronchial surface is generally its more immediate source. Being, therefore, intimately related to various changes of the lungs themselves, and often occurring in consequence of these changes, it will be considered in connection with them. (See Lungs — *Hæmorrhage from, &c.*)

IV. Bronchi, Inflammation of the. Syn. *Bronchitis*, Badham, Hastings. *Erysipelas Pulmonis*, Lommius. *Catarrhus pituitosus, Angina bronchialis*, Stoll. *Catarrhus suffocativus*, Auct. Var. *Bronchitis Catarrhosa*, Hildenbrand. *Peripneumonia Bronchitis*, J. Frank. *Bronchite*, Fr. *Die Entzundung der Luftröhrenäste, Bronchialentzundung*, Ger.

Classif. 3. *Class*, Diseases of the Sanguineous Function; 2. *Order*, Inflammations (*Good*). III. Class, I. Order (*Author*, see *Preface*).

26. Defin. *Cough with, or without rigors, often preceded by coryza, and followed by expectoration of a transparent, pale, glairy, and watery fluid; more or less febrile commotion, dyspnœa, and slight soreness, heat, or tightness of the chest, which are diminished as the expectoration becomes more abundant and opaque.*

27. This important disease, until Dr. Badham directed particular attention to it, was, according to the particular form it assumed, confounded with common catarrh, with pneumonia, under the appellation of peripneumonia notha, and with other diseases of the lungs and air-passages, more especially tubercular consumption, dyspnœa, &c. Dr. Young seems to have viewed it as a modification or extension of inflammation of the trachea, or even as synonymous with that disease, probably from their occasional complication, or succession to each other. J. P. Frank appears to have been among the first who directed attention to the frequency and importance of inflammation of the bronchial surface. "Cum vero," he observes, "profundius per tracheam penetrat, ac in bronchia descendit inflammatio; tunc in primo casu tracheitidis speciem, in altero peripneumoniæ imaginem refert, in qua ultima vix non constantem internorum bronchiorum phlogosin in centenis cadaveribus deteximus." (*Interp. Clin.* p. 110.) "Rectam habebis febrium catarrhalium saltem fortiorem ideam, si eas pro inflammatione bronchiorum, sive pro bronchitide consideres." (*De Cur. Hom. Morb.* p. i. t. i. c. vi.) Broussais also noticed the frequency and importance of inflammation of the mucous surface of the bronchi (*Hist. des Phlegmas. Chron.* t. i. p. 75. Paris, 1800.). But it is chiefly to the writings of Badham, Broussais, Hastings, Laennec, Villermé, Alcock, Andral, and Chomel, that we are indebted for our knowledge of it as a specific disease.

28. Bronchitis commences variously, and assumes different forms and states, according to the intensity of the exciting causes, the severity of the attack, and the constitution of the patient. I shall consider it chiefly with reference to its activity and duration, to the states of vital energy and age of the patient, to its forms and complications, and to its results. Its general prevalence, severity, and not infrequent fatality, require for it a more particular notice than it has received, even recently, from several systematic writers. This will appear somewhat singular, when I state that I know of no disease that is more frequent, or productive of a greater number of deaths, in children, than it, in its different states and complications.

29. i. Acute Bronchitis assumes different grades of severity, and a modified type, according to the habit of body and vital energy of the patient, and the extent to which the inflammatory action advances along the bronchial tubes. It presents itself in practice, as a *primary disease*, in three forms: — 1st, Common catarrhal bronchitis, in which only the mucous membrane of the large bronchi and trachea are affected by the specific and often infectious inflammatory irritation constituting *catarrh*: 2d, Sthenic or true bronchitis, in which the inflammatory action is more acutely marked — is of a more phlogistic description, probably from its further extension along the bronchi, and from both the mucous and the sub-mucous tissue of the tubes being affected: and, 3d, Asthenic bronchitis, where, owing to weak vital energy, the inflammatory irritation assumes a lower and more asthenic grade, and extends still more generally, or affects especially the minute bronchi, interrupting their functions, and preventing those changes from taking place in the blood which are requisite to the support of the nervous and vital manifestations.

30. *A. Catarrhal Bronchitis* (*B. Catarrhalis*); *Mild Bronchitis* (*B. Mitis*); *Pulmonary Catarrh, Bronchial Catarrh, Catarrhal Fever; Bronchitis serosa, &c.* — This is the most common form of the disease, and generally commences with coryza,

or with slight hoarseness or sore throat, and other symptoms of catarrh extending down the larynx, along the trachea, to the large bronchi; the affection of the former parts generally subsiding as the latter become diseased. But it sometimes appears without any signs of irritation, either of the Schneiderian membrane, or of the tonsils or fauces, evidently originating in the trachea or large bronchi themselves, particularly in delicate persons, or in those disposed to coughs, pulmonary disease, and habitual expectoration.

31. A sense of roughness, with frequent attempts to clear the throat, is generally the first *symptom* of the disease. This is accompanied with, or followed by, titillation of the larynx, exciting a dry hard cough; hoarseness of voice, with a sense of tightness across the chest, and sometimes slight pain or soreness upon coughing or breathing deeply. Accompanying these local symptoms, more or less constitutional disturbance is generally present. The patient complains of lassitude, pain in the limbs and back, slight shiverings, or cold chills, quickness of pulse, and increased warmth, with dryness of the skin. The cough, which was at first dry, is now accompanied with a slight expectoration of a somewhat saline, glairy, and thin fluid; and as it rises towards the glottis, increases the cough, and renders the fits more frequent, probably owing to its irritating quality; in this resembling the secretion in coryza, with which it so often originates. In the slighter forms of the disease, the expectoration becomes in two, three, or four days thicker, more abundant and tenacious, less irritating, and somewhat more opaque; and with this change, the constriction, pain, and soreness, are diminished, or very much relieved; the pulse also is less frequent; the skin cooler and more moist; the urine less scanty, paler, and deposits a sediment; and the cough less frequent, although often in longer paroxysms. As the amendment advances, the sputum decreases in quantity, but is more opaque, tenacious, and deeper coloured, being frequently greenish white. This amelioration is most remarkable at first in the morning, and, as convalescence proceeds, continues throughout the day. At last but little expectoration takes place, and is observed, as well as the cough, only morning and evening. In slighter cases, the chilliness continues throughout, or alternates, with some increase of heat and perspiration; the pulse is scarcely affected unless towards evening; the expectoration is neither abundant nor very viscid; the fits of cough not severe, and chiefly in the night and morning. Such are the usual symptoms and course of catarrhal bronchitis, constituting what is usually named a cold upon the chest. But it sometimes assumes other characters; and then pulmonary catarrh is no more applicable to it than to inflammation of the substance of the lungs, in which, also, it occasionally terminates.

32. This form of bronchitis appears to consist of catarrhal irritation extending to, or originating in, the mucous membrane of the trachea and large bronchi, to which it is chiefly limited, without materially affecting the sub-mucous tissue. It seems not to be actual inflammation, or, if inflammatory action be present, it is of a peculiar or, specific kind, probably owing to its being seated in, or rather limited to, the mucous membrane; in which light it is viewed by Hildenbrand, who very justly considers catarrhal irritation to be distinct from true inflammation. This variety may assume an epidemic form, when its symptoms become somewhat modified (see Influenza.); and repeated or prolonged attacks of it often favour the developement of tubercles in the lungs, or even originate them, in scrofulous and delicate subjects. It may also pass more or less rapidly into either true acute bronchitis, or into the chronic form of the disease, owing to the extension of inflammatory action more generally through the bronchi, and to their sub-mucous cellular tissue.

33. *B. True Bronchitis (B. Vera); Sthenic Bronchitis (B. Gravis Sthenica); the Acute Mucous Catarrh of* Laennec. — This more decidedly inflammatory form of the disease is sometimes preceded by coryza or sore throat; and as these begin to yield, the morbid action extends along the mucous membrane to the trachea and bronchi. But it frequently also commences in this last situation, particularly in those who are liable to pulmonary disease, and to chronic coughs, and assumes a severe form. After these preliminary signs, sometimes hoarseness, or loss of voice, and always a dry hard cough, with a sense of soreness, rawness, dryness, and heat, are complained of under the sternum, preceded by marked chills or complete rigors. The chills at first alternate with increased heat and dryness of the skin; and are soon followed by quickened and somewhat laborious respiration; dyspnœa or oppression at the chest; sometimes a dull pain on coughing; quick, full, and often strong pulse; sickness or loss of appetite; pain in the forehead, back, and limbs; loss of animal strength, with an inability to leave the couch or bed; foul loaded tongue; constipated bowels, and scanty high coloured urine. As the disease advances, the frequency of pulse, the cough, expectoration, and general febrile symptoms, increase, as well as the tightness and soreness of chest; the latter sensation often amounting to an obtuse pain extending between the shoulders, to the back, and to the attachments of the diaphragm to the false ribs, sometimes with pale anxious countenance, and great oppression and anxiety. As expectoration comes on and increases, the sense of heat below the sternum diminishes. The cough is generally excited by a full inspiration; and from being short and dry, or attended by but little expectoration, becomes longer, more severe, and convulsive, accompanied with a more copious expectoration; and subsequently, in some cases, terminates in scanty vomiting, which promotes the discharge of a watery or serous and frothy mucus, sometimes in considerable quantity, which had accumulated in the bronchi and trachea. The febrile and other symptoms are aggravated towards night, which is generally sleepless and disturbed, the position of the body being on the back; but the posture is often changed. In some cases, particularly those which are not remarkably severe, each exacerbation of the fever is attended by chills; and throughout the disease, the sensibility of the surface to cold is very great. In the more phlogistic cases, especially in plethoric subjects, the dyspnœa and oppression are very urgent, the face is flushed, and sometimes slightly tumid, and the eyes injected. At a still more advanced period,

the tongue is often red at its sides and point, and deeply loaded in the middle and base; the breathing becomes rattling or wheezing, owing to the air struggling through the mucous accumulation in the bronchi, and the exertions to expectorate greater. In extreme cases of this description, collapse, with diminished expectoration, purple lips, orthopnœa, quick depressed pulse, cold perspirations and extremities, with threatening suffocation, occur as early as the sixth or eighth day.

34. The chief characteristic of this true form of bronchitis is the state of the *sputum*, which ought always to be carefully examined. When the disease attacks a person who never expectorates whilst in health, the cough remains dry for a considerable time; and those who expectorate habitually, cease to do so when the inflammatory attack is very acute. If the disease be slight, the sputum is often increased from the commencement, and its quality changed. As long as the cough continues dry, the disease may be said to be in its first stage. In the course of a period which varies with the constitution of the patient and the treatment employed, each fit of coughing is followed by the excretion of a clear, transparent, serous or watery mucosity, which is at first slightly saline, but afterwards becomes tasteless. It is without odour. As the disease advances, it is a glairy mucus, resembling white of egg. When it is poured into one vessel from another, it flows with extreme viscidity. The more it can be drawn out into a fine thread, and the greater its tenacity, the more marked is the irritation of the surface secreting it; the greater also being the oppression, heat, and anxiety in the chest, the violence of the cough, and the general febrile symptoms. In these very acute cases, it adheres closely to the sides of the vessel containing it by long striæ. When the fits of coughing are severe, there is a froth or sort of lather on its surface; and, in some cases, it is streaked with a little red blood, which, however, is not combined with the mucus as in pneumonia. Early in the disease, whilst the expectoration is fluid, transparent, or watery, it often contains small whitish flocculi, proceeding from the mucous cryptæ of the pharynx and fauces.

35. In proportion as the inflammation advances to *resolution*, the sputum loses its transparency, and is mixed with opaque, yellowish, whitish, or greenish matter, which increases until it forms nearly the whole of the expectorated mass, and is attended by a marked diminution of the symptoms: its quantity also is lessened. The inspection of the sputa thus not only serves to indicate the nature of the disease, but also its various stages. In cases of a relapse or aggravation of the inflammatory action, the sputum again becomes transparent, frothy, more abundant, and viscid; and the other symptoms increase. In several instances the disease will continue to fluctuate for several days, exhibiting symptoms of slight amelioration, soon followed by slight relapse or exacerbations, often occurring on alternate days, or at the tertian period, and assuming from this circumstance a remittent character, until either a more decided improvement takes place, or a more marked aggravation terminating in some one of the ways hereafter to be detailed (§ 39.).

36. In the two forms of the disease now described, the minute bronchi so far escape, during the favourable course of the disease, as that no material interruption to the functions of the lungs, in respect of the changes effected on the blood during respiration, takes place in them; the air still passing through them and reaching the air-cells: but, in certain of their very severe forms and complications, and of their unfavourable terminations, and in the variety next to be noticed, obstruction to the free circulation of air, and to the changes produced on the blood, in the lungs, occurs to a greater or less extent.

37. C. *Asthenic Bronchitis* (*B. Asthenica*); *Peripneumonia Notha*[*] of Authors; *Acute Suffocative Catarrh* of Laennec.—This variety of the disease generally occurs in very young, or in aged persons, in those of a phlegmatic or cachectic habit, and of lax fibres and exhausted powers of constitution, or who have been liable to chronic coughs, and to copious expectoration of a thin watery phlegm. Severe paroxysms of cough, with wheezing and oppressed breathing; foul loaded tongue; scanty urine; complete loss of appetite; very quick, small, or irregular pulse; little or no increase of heat, excepting at night; cold extremities; vertigo; pain in the head; exacerbating fits of dyspnœa, with a scanty expectoration at the commencement, gradually becoming abundant and frothy; are its chief symptoms in persons advanced in life. It is much less acute or phlogistic in its character than the preceding variety; and its duration is longer. In the more severe cases, the countenance is pallid and anxious; the oppression of the præcordia extremely great; and a full breath taken to relieve it brings on a severe fit of coughing, which sometimes terminates in vomiting, and relieves for a time the symptoms by favouring the excretion of the accumulated mucosities. The tongue is often dry, and brownish red at its point and edges, and sometimes covered at its base with a dark coating; the breathing is much more difficult; the lips and nails assume a blue livid appearance; the face becomes lurid or dusky; the patient cannot lie down in bed, or, if he does, starts up, after falling asleep, with a sense of suffocation; and the symptoms indicate either collapse, and obstruction of the air-passages, or effusion of fluid in the thoracic cavities, or even both: stupor or sopor; weak, wiry, and very frequent pulse; marked diminution of the sputa, cold extremities, orthopnœa, clammy sweats about the face and neck, suppressed urine, &c. ushering in a fatal termination.

38. This is, upon the whole, the most common form of bronchitis which is met with in *children*, particularly in the metropolis, and among the children of the poor, ill fed, and ill clothed, and those living in cellars, ground-floors, and badly ventilated lanes and apartments, and is often remarkably prevalent during the winter and spring. In this class of patients its approach is often insidious; and it usually commences with coryza, but not infrequently also with chills, febrile symptoms towards evening, wheezing, quick breathing,

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[*] "*Peripneumonia notha* fortior nobis bronchiorum catarrhus est, quo in pituitosis, obesis, senibus, cachecticis, laxisque hominibus frigida et humida sub tempestate, ab accedente membranæ mucosæ hos canales investientis irritatione, copiosior, tenaxque pituita celeriori passu secreta bronchiorum fines opplendo, suffocationem sat cito minatur." (J. P. Frank.)

and cough. There is at first little or no dyspnœa; but the tongue is loaded, the pulse accelerated and full, the face pallid or tumid, and the child has lost its animation. As the disease advances, the breathing becomes more quick and laborious; and fits of dyspnœa come on, generally followed by severe attacks of cough, which often terminate in vomiting; on which occasion only the bronchial secretion is presented for examination, and is found to consist at first of a viscid, watery mucus, and afterwards of a yellowish white, or a tenacious matter. These exacerbations are followed by remissions, during which the child dozes, and appears relieved, and the pulse becomes less frequent. Thus the disease may continue, with alternate remissions and exacerbations, for many days, until either a permanent diminution of the symptoms takes place, or an increased frequency of pulse, stupor, lividity of the lips, nails of the fingers, convulsions, &c. supervene, and indicate impending suffocation, with congestion or watery effusion on the brain.

39. Terminations. — *A. Duration.* The *sthenic* variety of the disease usually runs its course in about seven or nine days; but it may terminate either way as early as the fifth; or it may be prolonged to the 21st, or even the 28th day. Its duration will, however, chiefly depend upon the treatment employed, the complication it may present, the severity of the symptoms, and on the age and constitution of the patient. The *asthenic* form of bronchitis generally runs its course in a slower manner; it seldom terminates either way in less than fourteen days, and generally continues for several weeks (§ 37.).

40. *B.* In *favourable* cases, the sthenic form of the disease begins to decline from the fifth to the ninth day. The change is first evinced by the state of the sputum, as above described (§ 35.); by an amelioration of the cough, dyspnœa, and febrile symptoms: in rare instances, by copious epistaxis; by a more general and copious perspiration than that which frequently terminated the febrile exacerbations; by a more copious discharge of a paler urine, depositing a sediment; and by a diminution of the dyspnœa, of the frequency and severity of the cough, and of the quantity of the expectoration, which becomes pearly, opaque, thick, yellowish, or greenish yellow; at last, febrile symptoms recur only towards evening, and the disease disappears as in the first variety (§ 31.).

41. *C.* This favourable change is not, however, always observed, particularly when the attack is very severe, when treatment has either not been soon employed, or has not been sufficient to remove the disease, or when the secretion into the bronchi has been very profuse, and expectorated with much difficulty. In such cases, it either lapses into the chronic state about to be described; or, owing to the extension of the inflammation, to the air-cells and substance of the lungs, gives origin to pneumonitis, and even to pneumonitis combined with pleuritis, which is thus superadded to the original disease; or, from the great extent of surface affected, the consequent irritative fever, and interruption to the pulmonary functions, and the profuse viscid fluid filling up the bronchi, collapse of the powers of life supervenes, and the patient dies, either with cerebral affection, or with the usual symptoms of asphyxy, consequent upon diminished discharge of the morbid secretion, and its accumulation in the air-tubes.

42. *a.* When the disease thus terminates in *pneumonia*, the sputum becomes more rounded, thick, tenacious, and streaked with blood, which is more or less intimately mixed with it, and sometimes of a dark colour, giving it a rusty appearance; and the cough is more tight, hard, and deep. The oppression also increases; the cheeks are flushed with circumscribed red; the pain of chest is more severe, or is now complained of for the first time; the skin is partially covered with moisture, sometimes very abundant in parts; the chest, which was hitherto sonorous throughout, is dull, in some part or other, upon percussion; and the auscultatory signs of severe and dangerous pneumonia appear, on which delirium and other unfavourable symptoms often supervene, and terminate, with coma, the life of the patient.

43. *b.* Bronchitis, as it occurs either in the sthenic or asthenic form, may also terminate in chronic pleuritis, and in effusion of serum into the pleural cavity, and in some instances also into the pericardium, particularly in persons advanced in life, and in those who have experienced difficulty in the circulation through the cavities of the heart. In some instances of this description, the expectoration, and many of the other symptoms, are suddenly or quickly diminished; but the dyspnœa continues, and signs of effusion become more apparent as those of bronchitis disappear. In these, the consecutive effusion occurs in the form of a translation or metastasis of the morbid action from the mucous to the serous surface. In other cases, symptoms of pneumonitis, or pleuritis, intervene between the change in the bronchitic symptoms and the occurrence of effusion, with pain, more or less severe, loss of resonance in some part of the chest, and other auscultatory signs, indicating the extension of the inflammatory action first to the small bronchi, and thence to the substance of the lungs and the pleura. Dr. Hastings has detailed some cases of this termination in his work, and I have treated several instances at the Children's Infirmary; but it is chiefly the aged who are liable to this unfavourable occurrence.

44. *c.* In other unfavourable cases, the disease becomes, in the course of a few days, characterised by failure of the energies of life; oppression and uneasiness increase; the cough is more frequent, laborious, and convulsive; the sputum is either more abundant, frothy, tenacious, and glairy, or gelatinous, and excreted with great difficulty, or much diminished in quantity from want of power to excrete it; the pulse is more rapid, small, weak, and irregular, or intermittent; the pain of head more distressing; the countenance is pale, and the face and neck covered with a clammy sweat; the respiration very frequent and wheezing, sometimes with an audible rattle; and, at last, delirium, lividity, at first of the lips, afterwards of the countenance, great prostration of strength, and coma, supervene, and the patient sinks with all the signs of imperfectly changed blood. In some cases, cerebral symptoms come on much earlier, with either violent or low muttering delirium, which soon terminates in most profound coma. In a few cases, this early accession of delirium, or of violent headach, with other symptoms of consecutive inflammatory action,

ending in serous effusion on the brain, altogether removes the original bronchial inflammation, or in others moderates it greatly and masks it. I have observed this in *children*, and once or twice in robust adult persons; but in both classes of subjects it is a dangerous occurrence. More commonly, however, the cerebral symptoms continue increasing, with those referrible to the bronchi, till life is extinguished.

45. In other cases of very acute bronchitis, with very high fever and severe local symptoms, particularly with quick, laborious, short respiration, dyspnœa, anxiety, great sense of heat under the sternum, and bloated countenance, collapse takes place rapidly, particularly if an appropriate treatment have not been early employed; and either delirium, coma, and other cerebral symptoms, or those more directly depending on the circulation of venous blood, appear, and the patient is speedily cut off. In weak and nervous patients, and during unfavourable states of the air, the inflammatory action sometimes seems to invade nearly all the respiratory mucous surface, and is soon productive of a copious mucous secretion, which, either from its difficult excretion or rapid secretion, in some cases, speedily suffocates the patient.

46. In *children*, and rarely in adults, cases occur, in which the inflammatory action extends upwards, to the *trachea* and *larynx*, occasioning all the symptoms of laryngitis in addition to those of bronchitis, and frequently terminating fatally with convulsions and the signs of congestion in the head. In many of the unfavourable cases of bronchitis in children, the extent of the disease, and the copious secretion, occasion suffocation more or less rapidly, with somnolency, bloated, or livid countenance, convulsions, coma, and, at last, complete asphyxy: and, on dissection, congestion of blood, with watery effusion, is found within the cranium; the bronchi are filled with a muco-purulent matter, and the vessels of the lungs are loaded with blood.

47. COMPLICATIONS.—The most common states of complication, in which bronchitis presents itself in practice, are, 1st, With catarrhal sore throat, coryza, &c. of which it is generally consecutive, and with catarrhal inflammation of the pharynx and œsophagus. 2d, With inflammation of the trachea, or larynx, or both, of which it is most frequently consecutive; but also sometimes antecedent, as I have occasionally observed in children. Indeed, we have seldom croup in London uncomplicated with bronchitis in some one of its forms or states. 3d, With measles, scarlatina, or small pox, on which it very frequently supervenes; particularly in measles, sometimes very early in the disease, and before the eruption breaks out; but oftener in consequence of its premature disappearance, or retrocession. 4th, Very commonly with hooping-cough, especially during certain seasons and epidemics. 5th, Not infrequently with continued fevers, particularly in its asthenic form. 6th, Often with disorder, or even sub-acute inflammation, of the digestive mucous surface, and diarrhœa, in children, when it also assumes this form; the stools being offensive, and the tongue red at its point, &c.* 7th, With disease of the liver, and accumulations of bile in the gall-bladder, chiefly in adults; the tongue then being very deeply loaded with a yellowish brown crust, or fur; and the stools dark coloured, and most offensive. 8th, In some cases with erysipelas, particularly its epidemic and infectious form. 9th, With pneumonia, or pleuritis; these being either consecutive of the bronchitis, or simultaneous with it. 10th, With dropsical effusion into the pleura or pericardium, especially in aged persons: and, 11th, With inflammatory irritation in the substance of the brain, or in its membranes, with disposition to effusion,—a complication most commonly met with in children.

48. All these diseases are greatly aggravated, and their danger increased, from being associated with bronchitis; and they frequently terminate fatally by one or other of the unfavourable states which the bronchial affection assumes. Bronchitis thus complicated also presents, in consequence, either a more acute character, or the asthenic form; and, being attended by a more marked disposition to invade the smaller ramifications and air-cells, or by a more profuse secretion of mucus, and a rapid depression of the powers of life, the unfavourable terminations above described quickly supervene. In several of these complications, particularly with pertussis, measles, scarlatina, continued fever, cerebral affections, and diseases of the lungs or pleura, bronchitis often escapes detection, until it becomes either one of the most important, or the most dangerous, or an actually fatal lesion. When thus complicated with measles or other exanthematous diseases, the eruption, if it still continue on the surface, often assumes, as the powers of life sink, a dark or purplish hue; and a slight dirty blueness of the skin, particularly of the face, hands, &c. is generally observed in other cases, indicating the impeded functions of respiration, and the consequent changes in the blood. The frequency and importance of the complication of bronchitis with measles, especially before the appearance of the eruption, during its progress, and after its decline; and the occurrence of the former complaint, both during and after convalescence from the latter; are deserving of the careful attention of the practitioner.[1]

49. ii. SUB-ACUTE BRONCHITIS is characterised by the symptoms of the sthenic form of the disease in a milder and more chronic form. The cough continues longer dry, and the expectoration scanty, or thick, viscid, gelatinous, or albuminous, with tightness of chest, and oppressed breathing. In this form of the disease, a plastic albuminous exudation sometimes forms in the large bronchi, and lower part of the trachea, or in the large bronchi of only one lung, and is moulded in the form of the air-tubes; and is either expectorated in fragments, or in large tubular branches and ramifications. Cases of this description are detailed under the appellation of bronchial polypi by the older writers, and figures given of them by TULPIUS and others. Mr. ILIFF has published (*Lond. Med. Repos.* vol. xviii. p. 207.) a case of this description, wherein this production retained its ramified and tubular form. I have met with two cases where the albuminous exudation had been formed in the

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* During some seasons I have occasionally admitted in one day, at the Infirmary for Children, several cases, in which it was difficult to determine whether the digestive or the respiratory mucous surface was most affected. This complication is not infrequent during convalescence from the exanthemata, particularly measles and scarlet fever.

bronchi, and expectorated in fragments. It generally occurs in an uncomplicated state.

50. iii. CHRONIC BRONCHITIS often follows severe attacks of catarrh; and is also frequently consecutive of acute bronchitis; but it sometimes occurs primarily in the chronic state, particularly in aged persons. It differs in nothing from the acute or sub-acute forms, excepting in as far as the symptoms are altogether milder, and their continuance longer; there being no distinct line of demarcation between its grades of activity and chronicity. The chief means, by which we are enabled to infer, that the disease has assumed a chronic form, when it is consequent on the acute, is the continuance of the sputum for several days, in undiminished quantity, and the persistence of the opaque, whitish yellow, or yellowish green appearance, which it assumed upon passing from the transparent, fluid, and viscid condition characterising the acute form.

51. Chronic bronchitis assumes various grades of severity, and presents different phenomena, according to the changes which have taken place in the bronchi. In its *slighter states*, and primary form, as it is often met with in persons advanced in life, and as it prevails during winter and spring, or variable seasons, it consists chiefly of a frequent and almost habitual cough, with scarcely any pain in the chest, continuing for weeks, or even months, or recurring every autumn, winter, and spring; being most severe in the mornings, and much easier through the day, with slight dyspnœa on exertion, and copious viscid mucous expectoration; but without any marked febrile symptoms, excepting slight acceleration of pulse. Its *severer forms* are met with in young or middle aged persons, after catarrh or acute bronchitis; and are attended with fits of coughing, and copious expectoration; with oppression at the chest and præcordia; with febrile symptoms, particularly towards night; with copious perspirations in the morning, which often seem to increase the cough instead of relieving it; with loss of strength, emaciation, and slight disorder of the digestive organs. The cough is increased after getting into bed, and very early in the morning. The breathing is quick and laborious, particularly on any exertion; and the patient complains of slight tightness of the chest. The pulse generally ranges from 90 to 120; being the former whilst quiet in bed, and the latter towards evening.

52. Attention to the *expectoration* is very important, in order to enable us to judge both of the accession of this state of the disease, or of its aggravation or change into the acute form, which is not infrequent, and of the concurrent or consecutive alterations which often take place. The sputum occasionally continues long in the state now described. It is generally then inodorous, and without taste. But it oftener becomes greenish, or yellowish white, or muco-purulent; is mixed with a colourless watery phlegm, and is more or less abundant. In cases of a worse character, particularly when hectic symptoms are present, it assumes a more purulent appearance; is sometimes streaked with blood, or mixed with dark specks of blood, or consists chiefly of pus. These changes, however, seldom occur without much antecedent fever, and attendant emaciation, night sweats, occasional diarrhœa, and the symptoms of confirmed hectic. In rarer cases, the sputum becomes remarkably fœtid; but this change cannot be imputed to any particular lesion of the bronchi or lungs, excepting sometimes to considerable dilatation of the former. The whole of the symptoms in this class of cases so very nearly resemble tubercular consumption, as to be distinguished from it with much difficulty, and only by attending to the appearances of the sputum, and by examining the chest with the stethoscope.

53. The *sputum* generally partially swims on the surface of water. When it is thin, transparent, viscid, and frothy, it usually altogether swims; but when it is thick, in tenacious, opaque lumps, or in fragments resembling portions of albuminous exudation, it generally sinks. In all these states it cannot be diffused in the water. When it consists of yellowish white, or greenish yellow matter, it partly sinks, and by agitation is broken into ragged portions, and is partially diffused; and the more it approaches a purulent state, the more completely and readily is it diffused, imparting to the water, by agitation, a yellowish white appearance.

54. Chronic bronchitis is also sometimes *consecutive* of the eruptive diseases; but these diseases have generally altogether or very nearly subsided before the bronchial affection supervened. It occurs primarily from the irritation of minute particles of mineral or vegetable substances floating in the air, as is shown in the article on ARTS. It is sometimes also *complicated* with other chronic diseases of the lungs and pleura, more especially with *tubercles;* with diseases of the liver; with chronic inflammation, or other disorders of the mucous surface of the digestive tube, particularly of the œsophagus, stomach, and large bowels. In all these consecutive and complicated states, it presents no certain or unvarying forms; its chief character, its duration, progress, and termination, being modified by its severity, by the constitutional powers of the patient, by his diathesis, and by the quantity of expectoration. In some cases, the secretion from the bronchial surface is so profuse as to be the chief cause of the exhaustion and death of the patient.

55. iv. ANATOMICAL CHARACTERS OF BRONCHITIS.—*A.* When the body of a patient is opened, that has sunk under any disease whilst affected at the same time with a *mild and recent bronchitis*, some redness is found, generally in a circumscribed portion of the mucous membrane, and usually towards the end of the trachea, and in the first divisions of the bronchi. If the inflammation have been more *intense*, the redness extends to a greater number of these tubes, and exists, moreover, in the smaller ramifications. It sometimes happens that this redness is exactly limited to the bronchi of one lobe only; and it is the bronchi of the superior lobe which seems to be more particularly disposed to inflammation. The red colour of the bronchi presents itself occasionally under the form of a fine injection, which seems to exist both in the sub-mucous cellular tissue, and in the mucous membrane itself, and is usually attended by slight tumefaction. Sometimes the vessels cannot be distinguished, but only a number of small, crowded, red points, which are agglomerated the one around the other. Finally, an uniform red colour is occasionally observed. In some cases, the redness diminishes progressively from the large bronchi to the

small ones; in others, an opposite disposition is remarked. Occasionally the redness only exists in intervals, in the form of bands or of isolated spots, forming, as it were, as many circumscribed phlegmasiæ, between which the mucous coat is white and healthy.

56. *B.* When the inflammation is *chronic*, the mucous membrane generally loses its lively redness: it presents a livid, violet-coloured, or brownish tint. Finally, and what is very remarkable, in individuals offering all the symptoms of inveterate chronic bronchitis, with puriform expectoration, the mucous membrane of the lungs has been found scarcely rose-coloured, and even perfectly pale through its whole extent. Bayle and Andral have particularly noticed this fact. I would not wish to conclude that there is not, and least of all, that there has not been, inflammation in these cases; but I think a very copious secretion will often take place from mucous surfaces, and assume even a purulent appearance during its retention in the bronchi, from lost tone of the extreme capillary vessels, with, perhaps, an increased flux or determination of the circulating fluid in order to supply the discharge, all vascularity disappearing with the cessation of circulation. The other changes observed on post mortem inspection, particularly in the more chronic states of bronchitis, consist chiefly of thickening, softening, ulceration, &c. of the mucous membrane, dilatation of the bronchi, &c. (See § 7, *et seq.*).

57. v. Diagnosis.—The characters of the *cough*, and of the *sputa*, and the physical signs, are our chief guides in the diagnosis of bronchitis. The history I have given of the disease will be generally sufficient to enable even the inexperienced to recognise it: but it will often be necessary to arrive at more precise and certain information as to the extent of lesion, and its existence either in a simple or in a complicated form.

58. *A. Of the acute.* — *a. By auscultation.* In the first stage of the disease, the inflammation causes tumefaction of the mucous bronchial surface, and consequent diminution of the calibre of the tubes. This state occasions a modification of the respiratory sound in them: and, hence, either with the unaided ear, or with the stethoscope, we hear at first the "*dry bronchial rhonchus;*" consisting chiefly of a sibilous or whistling sound; occasionally with a deeper tone, resembling the note of a violoncello, or the cooing of a pigeon, particularly when the large bronchi are affected. These sounds (see Auscultation, § 14.), denominated the *sibilous* and *sonorous rhonchi*, are present chiefly in the early stage, and before expectoration takes place; and prove the accuracy of the rational inference of Dr. Badham, that the difficult breathing of this period is owing to the state of the mucous membrane; and I would add, of its sub-mucous cellular tissue also. To these sounds is added the *mucous rhonchus;* and in proportion as the bronchial secretion, to which it is owing, augments, this sound becomes predominant. When the inflammation is seated in the large tubes, the bubbles of mucous rhonchus are large and uneven; and the respiration may be still heard over the chest. But when the mucous rhonchus is fine, and is heard constantly, it may be inferred that the small bronchi are invaded. When this is the case in a severe degree, there is also slightly diminished resonance of the chiefly affected part upon percussion. As the disease proceeds, and the secretion passes into an opaque and thickened state, the mucous rhonchus becomes interrupted, sometimes with obstruction of the respiratory sound in a portion of the lungs, and passes into a sibilant or clicking sound. These changes arise from the entire or partial obstruction of one or more tubes by the thickened mucus, and are generally of temporary continuance: occurring now in one part of the chest, and disappearing; and now in another. This state of the bronchi fully explains the dyspnœa of this stage.

59. *b. Rational diagnosis.* — α. The *cough* in *bronchitis* is loose, diffused, and deep; in paroxysms, and attended with fever, often with wheezing. In *pertussis*, it is in severe paroxysms, unattended by fever or wheezing; is accompanied with a distinct whoop; and terminates in vomiting. In *croup* it is sonorous, clanging, and harsh. In *laryngitis*, it is suffocating, shrill, or grunting; and, on inspiration, attended with a drawing down of the pomum Adami to the sternum, and retraction of the epigastrium and hypochondria. In *pneumonia*, it is deep in the chest; frequent and short, often hard; and gives a metallic sort of noise. And, in *pleuritis*, it is short, dry, hard; sometimes slight, but always suppressed and painful. β. The *expectoration* in *bronchitis* is abundant after the second or third day, or even from the first: in *pertussis*, it only follows the vomiting: in *pneumonia*, it is more rounded, distinct, thickened, purulent, rusty, and intimately streaked with blood: in *pleuritis*, *croup*, and *laryngitis*, it is scanty, thin, frothy in the latter; sometimes with shreds or pieces of lymph, and entirely different in appearance from that of bronchitis. γ. *Pain* in *bronchitis* is scarcely complained of; and consists merely of a sense of soreness, heat, and tightness in the chest, particularly beneath the sternum, and is not increased on full inspiration: in *pneumonia*, it is more marked, especially in certain parts of the chest, generally nearer the lateral regions, and is increased on inspiration or prolonged expiration: in *pleuritis*, it is very acute, and a full inspiration is impossible: in *croup* and *laryngitis*, the pain is increased upon pressing the trachea and larynx. δ. The *countenance* in *bronchitis* is more frequently pallid or bloated; in *pneumonia*, it is generally flushed; and dyspnœa is greater in the former than in the latter. The breathing is *wheezing* and *hurried* in acute bronchitis; in pneumonia it is less so, and generally without the bronchial wheeze. The *pulse*, in the former, is frequent, full, free, developed, and soft; in the latter, full, hard, bounding or vibrating, and sometimes oppressed and undeveloped. The general febrile symptoms are more continued in pneumonia than in bronchitis; morning remissions, with free perspiration, being more frequent in the latter than in the former. The *physical signs* in pneumonia, pleuritis, &c., are the surest means of their diagnosis. (See art. Lungs — *Inflammation of.*)

60. Some cases of *asthenic bronchitis* may be mistaken for *humoral asthma;* and occasionally no very distinct line of demarcation can be drawn, both affections either insensibly passing into each other, or being complicated with one another. But, generally, the slow accession of the former,

the more continued and less urgent dyspnœa and tightness of the chest, and the presence of febrile symptoms, particularly great quickness of pulse, will distinguish it from humoral asthma; which is commonly characterised by the sudden accession of the paroxysms, their severity during the night, and the attendant orthopnœa, the more or less complete and prolonged intermissions, and especially by the absence of fever, and by the much more marked integrity of the vital and animal powers, than in asthenic bronchitis. In this latter disease, the patient is incapable of leaving his bed or his apartment: in asthma, he may attend to his avocations; or may, at least, change his room in the intervals between the fits. The diagnosis between the *sthenic* bronchitis and asthma is attended with no difficulty. (See Asthma, § 50.)

61. *B. Of the chronic.* — *a. By auscultation.* The physical signs of this form of bronchitis are not materially different from the acute. The respiration is extremely varied: being sometimes louder, at other times more obscure than natural, and generally accompanied with the *mucous rhonchus;* which, however, is not heard over the chest, but now chiefly in one part and then in another, and seldom during the whole of the respiratory act. The occasional occurrence of the *sibilous* and *sonorous* rhonchi indicates that the tubes are sometimes partially obstructed; but this is much less frequent than at the commencement of acute bronchitis; and it rarely happens that the respiration is entirely interrupted in a part of the lung. Very often, also, when the dyspnœa is considerable, or even urgent, the air is heard to enter the lungs as well as usual, the respiratory sound being either distinct or puerile. The resonance of the chest on percussion is scarcely diminished. When the bronchitis is very chronic, the tubes sometimes become *dilated,* from being weakened by the inflammation and strained by the paroxysms of coughing. When this state of the bronchi exists, the sputum is often fœtid, and several of the auscultatory signs of tuberculous excavations of the substance of the lungs are present. If the dilatations be large and rounded, it may furnish *pectriloquy* and the *cavernous rhonchus;* but if, as is more generally the case, it extend to several tubes, or if they be dilated along a considerable portion of their axis, a loud *bronchophony* is only heard. If this dilatation be extensive, bronchophony, bronchial respiration, sometimes with a "*veiled blowing,*" and even slight pectriloquy, will be heard in corresponding parts of the thorax. On *percussion,* the sound is often somewhat less than natural, owing to the compression of the surrounding pulmonary tissue; and owing, also, to this cause, the dyspnœa is often great. Dilated bronchi remain long stationary; tuberculous excavations generally increase rapidly. The former are most frequently situated in the scapular, mammary, and lateral regions; the latter in the sub-clavian and sub-acromian regions of the chest. (See the diagnosis in *Tubercles* in the Lungs.)

62. *b. Rational diagnosis.* — It is chiefly with tubercles in the lungs that chronic bronchitis is liable to be confounded; and, indeed, without the aid of auscultation, the diagnosis between them is very difficult. When they both co-exist, and especially when the latter is attended with dilatation, we have seen that even auscultation does not easily enable us to ascertain the exact state of disease: however, by a careful comparison of the physical and rational symptoms of both, we may generally form a tolerably correct opinion. Early in chronic bronchitis, the absence of pain during inspiration, the capability of resting on either side, the pallidity of the lips and countenance, the appearance of the sputum (§ 34, 35.), and the wheezing noise on respiration, may readily distinguish it from tubercular phthisis. As the disease advances, the symptoms more nearly resemble tubercular consumption; but the pallor of countenance and absence of pain generally continue; or, if the latter be present, it is diffused over the chest, and the patient can draw a larger volume of air into the chest, and retain it longer, than in phthisis. The dyspnœa is less on exertion, consists more of a stuffing sensation, and is more relieved by expectoration; the sputum generally consists of a more considerable portion of mucus, and is more regularly abundant; and the perspirations are much more partial, the emaciation less, and the paroxysms of hectic much less regular, than in tubercular disease. The cough is very different. In chronic bronchitis, it is generally deep and sonorous, and in paroxysms; in phthisis, it is short and tickling. When we find copious purulent expectoration, but without broken-down portions of softened tubercles or of the pulmonary tissue; night sweats; hectic fever, with full deep cough, and absence of the physical signs of phthisis; — if, after repeated examinations, there can be detected neither a constant absence of the respiratory murmur, nor gurgling cavernous rhonchus, nor pectriloquy, nor marked defect of resonance on percussion, — we may safely conclude the disease to be chronic bronchitis. When this disease depends upon the inhalation of irritating substances, as Dr. Hastings very justly remarks, the cough and copious muco-purulent expectoration often continues for months, or even years, without much suffering, with pale countenance, slight lividity of the lips, &c. In these cases there can be no difficulty in the diagnosis.

63. vi. Prognosis. — *A. In the acute.* When the disease is slight, or limited to a few bronchi only, the disease generally terminates favourably. The change is indicated by a more perfect apyrexia in the mornings, less severe and less frequent cough, easier expectoration, and a thicker and more opaque sputum; which, however, generally assumes a more fluid and glairy appearance for a few evenings during the febrile exacerbation. A *relapse* of the disease is indicated by increase of the fever and cough, and a more transparent, fluid, and glairy expectoration. When the inflammation is very severe and general, as indicated by high fever, dyspnœa, &c., the prognosis should be unfavourable, or given with caution. If symptoms of collapse have appeared, and the mucous rhonchus be heard universally, and with little or no respiratory murmur upon auscultation; if the pulse become very frequent, small or weak, irregular or intermittent; and if the countenance be at the same time pallid and anxious, slightly livid, or the nails of the fingers and lips tending to purple; the danger from asphyxia is extreme. When the disease occurs in the course of continued or exanthematous fevers, in some epidemic states of hooping-cough, and in the other severe

forms of complication (§ 47, 48.); and when the signs indicating the unfavourable *terminations* already enumerated appear, the danger is also great, although it may not be extreme. The supervention of pneumonia or pleuritis, or of tracheitis or laryngitis; a sudden diminution of the expectoration; the occurrence of cerebral symptoms, of orthopnœa, or even continued dyspnœa, with expansion of the nostrils; a dark red colour of the tongue; are all unfavourable circumstances, and indicate imminent danger. On the other hand, when spontaneous evacuations occur, with a favourable change in the cough and expectoration, particularly on one of the critical days, although the attack has been extremely severe, a favourable result may be looked for; more particularly if the disease proceeded from cold, and was uncomplicated.

64. The *asthenic* form of the disease is very dangerous, when occurring at the extremes of age; but less so when it is unattended by marked depression of the powers of life, and by signs of the circulation of venous blood, — circumstances which, in connection with the frequency, weakness, and irregularity of the pulse, the quantity and appearance of the sputa, and with the difficulty of expectoration, constitute the danger.

65. *B. In the sub-acute and chronic.* — If it have arisen from catarrhal affection, and be unattended by much emaciation or hectic, this form of the disease will generally terminate favourably, although the expectoration present a puriform appearance. The more purulent, however, this excretion, and the more marked the symptoms of hectic, the greater the danger. But when the sputum seems to consist chiefly of mucus, although the quantity expectorated be great, a favourable issue may take place; and this will be more frequently the case when the chronic bronchitis has been consecutive of the acute. When there are constant dyspnœa, very frequent pulse, profuse sweats, and copious purulent expectoration, with emaciation, hectic fever, colliquative diarrhœa, associated symptoms of disease of the liver, or of the mucous surface of the bowels, with a smooth, glossy, or chopped, a dark red, or raw appearance of the tongue, a most unfavourable prognosis should be given; and if to these succeed aphthous eruptions about the mouth and tongue or fauces, little hope of recovery can be entertained. The causes and complications of the disease should also materially influence our prognosis. When it has arisen from mechanical irritation of the bronchi, patients often recover from a very unfavourable state, when the irritating cause has altogether been removed. The occurrence of bronchitis in the scrofulous diathesis, and its association with tubercles in the lungs, are dangerous circumstances. This *complication* is to be ascertained chiefly by means of the physical signs. If these indicate the existence of tubercles, or do not establish with certainty their absence, a very cautious opinion should be given. The mucous rhonchus, and dulness on percussion, with the rational symptoms of tubercles, are indications of a very dangerous malady. The rapid developement of symptoms of the acute, in the course of chronic bronchitis, must be viewed as an unfavourable circumstance. The extremes of age also increase the risk in this as well as in the acute state of the disease.

66. Causes. — *A.* The *predisposing causes* are, whatever lowers the energies of the frame, more particularly too warm or crowded apartments; sleeping with too many clothes; late rising, late hours, and too great sexual indulgence; very early, and far advanced age; the lymphatic and sanguineous temperaments; relaxed habits of body; febrile and exanthematous diseases, and the suppression of accustomed eruptions and discharges.

67. *B.* The *exciting causes* are, exposure to a cold and moist atmosphere, or to currents of air, particularly when perspiring: rapid vicissitudes of weather and season; wearing damp clothes or shoes, or sleeping in damp beds or linen; continued exposure to dry cold; quick refrigeration of the body after being over heated and fatigued, or upon coming from crowded apartments and assemblies; wearing too low or very thin dress, with exposure of the neck and chest; rapid atmospherical changes, particularly during autumn, winter, and spring, and especially from cold to heat; epidemic constitutions of the atmosphere; easterly and north-east winds; exposure to the night air after rain; the inhalation of irritating gases, vapours, or mineral or vegetable particles (see Arts and Employments, as *Causes of Disease,* § 40.); sudden passage from the cold air into overheated apartments; catarrhal infection; miasmal exhalations in cold and moist states of the air; the imperfect irruption or retrocession of the exanthematous diseases; and the translation or metastasis of gout, rheumatism, erysipelas, &c.

68. vii. Treatment. — 1st, Of Acute Bronchitis. — *A. In its simple states.* M. Broussais gives a very concise view of the indications of cure in this form of the disease, which has been adopted, *verbatim*, by Dr. Hastings; without, however, referring to the original writer. M. Broussais very justly recommends that the excitement of the sanguiferous system should be moderated, by general blood-letting, acidulated and mucilaginous fluids, and abstinence from stimulating food; that perspiration be favoured, by saline and antimonial medicines, and by emollients, both internally and externally employed; and that the irritation and congestion of the diseased vessels be relieved by local depletions and emollient revulsants when erythism of the capillaries predominates, and by rubefacients and vesicatories when the nervous powers are depressed.

69. *a.* In the *first variety* of the disease, *blood-letting* is seldom requisite; saline and antimonial medicines, with demulcents, emollients, &c. being generally sufficient. When, however, fever is considerable, and the patient complains of soreness or slight pain in the chest, a moderate bleeding — preferably by cupping — will be serviceable; and full doses of antimony, or as much as the stomach will bear of the solution of tartarised antimony, in frequently repeated doses, will soon remove all febrile disturbance. The following mixture has generally answered this purpose in my practice (see also F. 393. 854.): —

No. 66. ℞ Mist. Camphoræ, Mist. Amygdal. Dulc., āā ℥ ij.; Liq. Ammoniæ Acet. ℥jss.; Spirit. Æther. Nit., Vini Antimon. Tart., āā ʒ ijss.; Syrup. Tolutan. ʒ jss. M. Capiat coch. ij. larga secundâ quâque horâ.

70. In the *third variety*, or the asthenic form of the malady, blood-letting is generally required; but it ought to be resorted to with much caution, and early in the disease, as recommended by Sydenham and most practical writers of the present

day. From eight to ten ounces may be taken from a vein, but, I think, preferably from between the shoulders by cupping; and afterwards, revulsants, counter-irritants, and expectorants, may be employed. The admissibility of depletion, or of antimonials, or the extent to which they should be carried, and the propriety of having recourse to stimulating expectorants, necessarily depend, in this form of the disease, upon the degree of morbid action and of vital power presented by individual cases, and upon the quantity of the expectoration and the difficulty to excrete it. Moderate local depletions are more generally required when this state of disease occurs in children, than when it is met with in aged persons; whilst the latter are more benefited by expectorants, diaphoretics, counter-irritants, and diuretics, than the former class of subjects.

71. In the *second variety* of bronchitis, particularly when the patient is young, plethoric, or robust, blood-letting should be early and energetically employed, and be directed as recommended in the art. on the Blood (§ 64.); and a full impression made upon the circulation, short, however, of syncope. Immediately afterwards, the preparations of antimony, combined according to circumstances, should be given in full and frequently repeated doses, so as to prevent the return of excessive local or general action, and to promote a free and universal perspiration. The preparations of antimony that may be selected for this purpose are the ant. tartar., James's powder, or the kermes mineral (F. 637.); and the first doses of them may be advantageously combined with calomel. The following may be exhibited; or F. 24. 513. 530. 638., or other similar formulæ, contained in the Appendix: —

No. 67. ℞ Hydrarg. Submur. gr. vj.; Pulv. Jacobi Veri gr. v.; Camphoræ rasæ gr. j.; Extr. Hyoscyami gr. v.; Conserv. Rosar. q. s. ut fiat Bolus statim post venæsectionem sumendus.

No. 68. ℞ Mist. Camphoræ ℥j.; Liq. Ammon. Acet. ʒ ij.; Potassæ Nitratis gr. vj.—x.; Spirit. Æther. Nit. ♏ xx.; Vini Antimon. Tart. (vel Vini Ipecacuanhæ) ♏ xx.—xxx.; Tinct. Hyoscyami ♏ xv.; Syrup. Tolutan. ʒ j. M. Fiat Haustus, tertiis horis capiendus.

When antimonials are given in as large doses as the stomach will bear, and frequently repeated after the first full depletion, a second will not often be necessary; or local blood-letting will be sufficient. But if the febrile excitement and the state of the pulse and of the blood drawn indicate it, venæsection may, in robust subjects, be again repeated to the extent already indicated. When this variety of the disease affects *children*, blood-letting, either general or local, according to the age, should be prescribed, with saline diaphoretics, followed by the semicupium or pediluvia. In all classes of subjects, *blood-letting* must be regulated according to the state of the pulse, heat of skin, the character and quantity of the expectoration, the presence of pain, and the prevailing character of diseases; attention to these circumstances being especially required in children and aged persons.

72. *b.* The choice of *diaphoretics* in this disease is deserving of notice. Early in the *first* and *second* varieties I have usually preferred tartarised antimony, generally in solution, and conjoined with the vin. ipecacuanhæ, or with the spirit. æther. nit., small doses of camphor, &c. But in infants or very young children, in the aged, and in the *third* or asthenic form of the disease, ipecacuanha seems preferable, — in the latter class of subjects particularly, combined with camphor. In the more catarrhal, or less acute, forms of the complaint, ipecacuanha, combined with nitrate of potash and opium; and, in the more sthenic states of the disease, the same medicines, in larger doses; will often prove equally serviceable as the preceding. While febrile excitement continues much increased, diaphoretics or diuretics are often exhibited with little advantage, as the restoration of these secretions is rather the consequence, than the cause, of diminished or exhausted febrile commotion. The object, therefore, should be, first to lessen the excitement by depletion, alvine evacuations, and sedatives; and then to make choice of those diaphoretics which produce a lowering and refrigerant operation, until the strength of pulse and heat of skin are reduced. Hence the propriety of adopting the medicines already recommended, and combining them with the nitrate of potash, and with each other.

73. *c. Emetics* are amongst the most beneficial remedies we can resort to in certain states of bronchitis, particularly in the *third* variety; and, in the *second*, after blood-letting: in children they are often remarkably useful. They have the effect of unloading the bronchi of the mucus accumulated in them, of relaxing the surface, and afterwards of promoting perspiration. For children, ipecacuanha should be preferred; and for aged persons, and the third variety of the disease, the sulphate of zinc. In the second form, and in all other subjects, the tartarised antimony is the best emetic that can be prescribed, as it operates both by vomiting, by lowering vascular action, and promoting perspiration. Emetics are more particularly required when the expectoration is difficult or suppressed, the cough severe and suffocating, and when the disorder depends upon the inhalation of irritating particles. They moreover tend to promote the operation of purgatives, which are generally much required in this disease. In cases of extreme depression, with suppressed excretion of the secretion, the stimulating emetics in the Appendix (F. 402, 403.) should be selected.

74. *d. Purgatives and cathartics* have been considered by several writers as of doubtful efficacy in pulmonic inflammations; and, when expectoration is established, as being even prejudicial. Such appears also to be partly the opinion of an able reviewer in the *Medico-Chirurgical Review* for Dec. 1820. But it is not quite in accordance with my experience, which, at the Infirmary for Children alone, must have amounted to some thousand cases of the different forms of the disease. It should be kept in recollection, that the expectoration in bronchitis is not a salutary discharge from the lungs, the promotion of which is a beneficial indication of cure; but that it is the product of a morbid state, of the nature of which it is an index; that this state is generally inflammatory, and always attended with determination of the circulating fluids, thereby keeping up the discharge. It is obvious, that whatever tends to increase the morbid determination to the bronchial surface will increase the disease, and, consequently, the expectoration; and that whatever derives from this situation will proportionately diminish both. That purgatives or cathartics, judiciously combined, have the effect of deriving from the lungs, by increasing the se-

cretions of the liver and digestive mucous surface, must be evident; and I have accordingly found them serviceable when thus prescribed. Severe attacks of bronchitis, moreover, are favoured by congestions and accumulations of bile in the biliary organs, and by sordes retained on the mucous surface of the bowels. In all those cases more especially — wherein the stools are generally very offensive — and at the commencement of all the forms of the disease, these medicines ought to be exhibited, with the view not only of promoting the abdominal secretions, and of removing fæcal matters and sordes, but also of deriving the circulation from the seat of disease; and the bowels should be kept very freely open throughout the treatment. It is, of course, understood that we are not to prescribe cathartics to the extent of depressing the energies of the frame too low, especially when they are already weak. Indeed, purgatives may be as much required, and as beneficially employed, in asthenic cases, as in others of a more phlogistic description, particularly if the bowels have been neglected; effects of a very different nature from that of mere evacuation arising from a judicious choice and combination of them. Thus, when prescribed with bitters, tonics, stimulants, or antispasmodics (F. 266. 471. 572. 880, 881. 887.), in the asthenic or suffocative states of the disease, not only will full alvine evacuations be procured, but also a tonic effect on the digestive organs; and, consecutively, a more moderate secretion in the bronchi, with an easier expectoration, will be produced. I have observed that the combination of purgatives, especially calomel, or those of the resinous class, with camphor, antimony, and hyoscyamus, according to the circumstances of the case, is particularly serviceable in bronchial diseases.

75. *e. Expectorants* have been much abused in inflammations of the bronchi; chiefly from the circumstance of the expectoration being too generally viewed as a salutary discharge which ought to be promoted, instead of its being a product of the inflammatory state, or of active determination to the surface of the air-vessels. I consider them quite inadmissible when there is much fever or heat of skin, or when the sputum is abundant and fluid, the patient having sufficient strength to bring it up; and generally in the *second* variety of the disease. On the other hand, in the *third* variety, or when the expectoration is arrested evidently from want of power to throw it off, or to excrete it, or from its great viscidity, expectorants will be of much service. In such cases, *ammonia* and *camphor* should be first tried, as being generally least detrimental in doubtful cases, and most quickly beneficial. Where the admissibility of expectorants is evident, especially in the asthenic form of the disease, and in aged persons, *squills, ammoniacum, galbanum*, or *senega*, may be directed; with the precautions, and in the forms, recommended when treating of them with reference to humoral asthma. (See Asthma, § 89. 103.; and ℞ No. 41—46.) When expectoration is rendered difficult, and the cough suffocative, from the tenacity and consistence of the sputum, as is sometimes the case, *attenuants* and *alteratives*, as the fixed alkalies combined with ipecacuanha, &c., or as prescribed in the article on Asthma (§ 103. ℞ No. 50, 51.), and exhibited with camphor or ammonia, will be found of much service. In nearly all states of bronchitis, *camphor* is a most valuable medicine. Its virtues have been singularly overlooked by the writers on this disease; but, when combined with *colchicum*, or with antimony, nitrate of potash, ipecacuanha, &c., and given in small doses, in the more inflammatory and febrile states of the disease; or when prescribed in progressively larger quantities, with *diuretics*, the spirit. æther. nit., opium, &c., as the vascular excitement subsides, and febrile heat disappears; and in large doses (from five to ten grains), with ammonia, ammoniacum, senega, opium, &c., when exhaustion and difficulty of expectoration from deficient power are urgent; it is one of the most valuable remedies we possess in this, as well as in several other diseases.

76. *f.* The *inhalation of emollient and medicated vapours* are occasionally of much benefit in the sthenic form of the disease, but chiefly in its first and second stages. The vapour arising from a decoction of marsh mallows, or from linseed tea, or from simple warm water, is the best suited to this state; and should be employed from time to time, the *temperature of the apartment* being duly regulated through the treatment, and constantly preserved from about 66° of Fahr. to 75°. Dr. Paris recommends, during the dry easterly winds of spring (when the disease is so prevalent), the vapour of warm water to be diffused in the patient's apartment. In the early stage it may be of advantage. In the case of the son of an eminent medical writer, attended by Dr. Gordon, Mr. Annesley, and myself, this was tried in the state of the air alluded to, but with no benefit. The case terminated fatally, from extension of the disease to the air-cells and substance of the lungs. When the expectoration becomes whitish, opaque, and thick, the vapour may be rendered somewhat more resolvent by adding a solution of camphor in vinegar, and extract of conium or hyoscyamus to the hot water, or to the emollient infusions now mentioned; and in the asthenic variety, particularly when the difficulty of expectoration, and the fits of dyspnœa, are distressing, or when the excretion of the morbid matter is impeded or suppressed from want of power, the medicated vapours and gases recommended in the chronic state of the disease (§ 98.), and in humoral Asthma (§ 88.) may be tried.

77. *g.* There are various medicines which are occasionally useful, when exhibited in appropriate states and periods of the disease. Amongst these, *narcotics* and *sedatives* deserve an especial notice. *Opium* should not be exhibited alone, as long as febrile action is great; but, in combination with antimony, or ipecacuanha, and nitre, it is often a most valuable medicine. It is best given in small or moderate doses, in conjunction with camphor and expectorants, where vital power is reduced and expectoration difficult (§ 37.). In general, when the skin becomes cool, the bowels are well evacuated, and the air-tubes remain irritable, opium, or some other narcotic or anodyne, is indispensable. Opium, and others of this class of medicines, particularly when judiciously prescribed, are then of service, not only in diminishing the irritability of the system and of the air-passages, and in lessening the cough, the frequency or severity of which often aggravates the inflammatory irritation of, and determination to, the bronchial surface, but also in equalising the circulation, in determining to

the skin, and promoting perspiration. In the more phlogistic states of the disease, and at its commencement, *colchicum* or *digitalis* will be often of advantage, in diminishing vascular action, local determination, and morbid irritability. They ought, however, seldom to be used at the same time. In the more sthenic cases, *digitalis* is very beneficially associated with the preparations of antimony. When the sputum is thick and opaque, *colchicum* is generally less beneficial than at an earlier period, excepting in conjunction with diuretics and camphor. When the skin has become cool, it is no longer of use. In the *third* variety, it is seldom indicated, unless at the commencement of the disease, or when combined with ammonia and camphor. Upon the whole, both colchicum and digitalis are less to be depended upon in acute bronchitis, than a judicious combination of antimonials with anodynes, &c. *Hyoscyamus, conium,* and the extracts of *poppy* and of *lettuce*, are also very generally serviceable in the different forms of bronchitis. But with them, likewise, the amount of advantage will entirely depend upon the manner in which they are prescribed. In the sthenic and febrile states of the disease, and at its commencement, they should be associated with antimonials, ipecacuanha, refrigerants, demulcents, and emollients (F. 24. 208. 427. 554.); with diaphoretics (F. 394. 568. 809.); and with diuretics (F. 818. 865. 893.); or in other similar forms, of which there are several in the Appendix. When the disorder assumes an asthenic state, or when expectoration is difficult, the cough distressing, and the skin cool, any of the sedatives particularised may be conjoined with either ammonia, camphor, or the fixed alkalies, or with other attenuants (F. 835.), and with expectorants, &c. (F. 356. 555. 558. 811. 895.) according to circumstances.

78. *h.* When the acute form of the complaint seems to be about lapsing into the chronic, the combination of *gentle tonics* with emollients and diaphoretics is often of service, as was first pointed out by M. Broussais, who allowed also red wines much diluted with water in this state. The infusion or decoction of cinchona, or the infusion of uva ursi, may be thus prescribed: —

No. 69. ℞ Decocti vel Infusi Cinchonæ ℥ iijss.; Liq. Ammon. Acet. ℥ jss.; Mucilag. Acaciæ ʒ ss.; Spirit. Æther. Nit. ʒ ijss.; Tinct. Camphoræ Comp. ℥ ss.; Extr. Conii gr. xx.; Syrup. Tolutan. ℥ ss. M. Capiat Cochleare unum amplum secundâ vel tertiâ quâque horâ, vel Coch. ij. quintis vel sextis horis.

79. *i. External measures* ought not to be overlooked during the course of the disease. In respect of *local* or general *depletions* nothing need be added to what has been already stated. The former of these should always be preferred when doubts are entertained as to the propriety of taking any considerable quantity of blood; and, in the sthenic form of the disease, may be resorted to at an advanced stage, particularly when the change in the expectoration, and other symptoms (§ 35.), indicate a return or exacerbation of the inflammatory action. *Blisters* are not admissible in the early stages of sthenic bronchitis. But, in the asthenic disease, or when inflammatory action and febrile heat have been subdued by depletions, &c., blisters are of much service, and may be applied either between the shoulders or on the breast; and, in some severe cases, re-applied or kept discharging for some time. In young children, and in adult or aged persons, when the secretion of the bronchial surface is profuse, and the powers of life much exhausted, I have derived more permanent advantage from the use of the rubefacient *liniments* in the Appendix (F. 295, 296. 311.), rubbed assiduously twice a day over the chest or back, than from blisters. When blisters are employed, much benefit will sometimes arise from removing them as soon as slight redness of the skin is produced, and covering the part with a large warm bread and water poultice, which ought to be frequently renewed; or by applying a succession of warm fomentations. In some extreme cases of this description, I have seen much advantage derived from applying over the epigastrium and lower part of the chest, a flannel wrung out of hot water, and immediately afterwards soaked with the spir. terebinth., and allowing it to remain until severe burning heat of the skin is produced by it. If suffocation be threatened either by the profuseness of the secretion, by its difficult expectoration, or by exhaustion of the vital energy; and if we be, as we then unfortunately are, at a loss for any probable means of success; this will sometimes have a remarkable effect, and save the life of the patient, particularly when assisted by the internal use of camphor, ammonia, &c. At the time of my writing this, a case occurred, attended by Mr. Faxon and myself, where immediate relief and a speedy recovery followed this almost *dernier ressort*. And I have often witnessed a similar result, in other most dangerous cases of this description, from the internal as well as the external use of this most valuable remedy, particularly at the Infirmary for Children, where I have for many years had recourse to it in cases of danger.

80. The *tepid bath*, or semicupium, will often be of service early in the disease; and in its course sponging the surface of the chest, or of the whole trunk, with warm water and vinegar, and afterwards with the warm nitro-muriatic acid lotion (F. 834.), particularly towards the decline of the disease, when we dread its lapsing into the chronic, and in the asthenic variety, will often prove of essential service. The common *beverage* of the patient during the treatment should be regulated according to the state of febrile action, and its compatibility with the treatment directed. Barley water, with any of the vegetable acids, tamarind water, or any of the formulæ or drinks (vide Potus), contained in the Appendix, may be directed.

81. *B. Of the complicated states.* — *a.* Bronchitis is not infrequently associated, particularly at its commencement, with *sore throat*; inflammation existing not only in the *fauces*, but extending to the *pharynx*, and through the larynx down the trachea and bronchi. This state of disorder sometimes obtains in *scarlet fever*, forming a complication of remarkable danger. I have also observed it, in a very severe form, affect six members of one family, and three of another, both living in the vicinity of the metropolis, in a low damp situation, all of whom had long previously had scarlatina. In some of these cases the danger was great, and all were severe and of the asthenic type. Purgatives, first consisting of calomel and James's powder, and subsequently combined with stimulants and tonics, were actively exhibited. Demulcent linctures (see Linctus, in the *Appendix*), or astringent, cooling, and antiseptic gargles; external revulsants, and rubefacients; the inter-

nal exhibition of camphor, combined with antimonials, hyoscyamus, diuretics, and afterwards with ammonia, mild attenuants, expectorants, and tonics; the liquor ammoniæ acetatis, with infus. cinchonæ, spirit. æther. nit., or spirit. ammon. arom., &c., formed also the chief means of cure. All the cases terminated favourably.

82. *b.* When the disease is complicated with *scarlet fever*, the treatment will altogether depend upon the character of the prevailing epidemic, and the circumstances of the case. Early in the complication, local depletions are sometimes required; and afterwards, full doses of camphor or ammonia, or of both, — particularly if the eruption prematurely disappear, or present a dark tint, or if the anginous affection assume an ash-colour, or a dark red, or brownish hue, — are amongst the chief remedies to be depended on. I have met with severe cases in which the bronchial disease either preceded, or followed, the efflorescence and decline of the eruption in scarlet fever; and in the course of this association most violent cerebral symptoms have supervened; thus forming a double complication. These cases, although extremely dangerous, are not necessarily fatal. Local depletion, sometimes to a very considerable extent, may be practised, chiefly by leeches applied over the sternum, behind the ears, or below the occiput, or by cupping on the nape of the neck; and calomel, antimony, revulsants, purgatives, camphor, ammonia, &c., according to the circumstances of the case, should be prescribed. Counter-irritation by rubefacient liniments is particularly required in complications of the disease with scarlatina or measles. Formulæ No. 299. and 300. may be used for this purpose, or the following: —

No. 70. ℞ Camphoræ ʒj.; Pulv. Capsici ʒss.; Olei Macis ♏ xxx.; Olei Olivæ ℥jss.; Liq. Ammon. ʒ vj. Misce. Fiat Linimentum.

83. *c.* The appearance of the disease with *measles*, either previous to, in the course of, or subsequently to, the eruption; or even its accession during convalescence, is a very frequent occurrence. This association was very common in the winter and spring seasons of 1829, 1830, 1831, and 1832; during which epoch, blood-letting was not so generally indicated, nor so well borne, as in former years, the bronchial affection being more frequently of the asthenic stype. In general, however, local depletions are required early in the disease, and, in some cases, may be carried to a considerable extent; often much further than in its association with scarlatina. I have sometimes found it necessary to deplete locally in both these states of complication, at the very time when I judged it proper to exhibit camphor or ammonia in considerable doses. But in many instances, particularly during the years above specified, patients have recovered as readily when no sanguineous depletion has been employed, as where it has. Bronchitis occurring either in the course of scarlatina, measles, or small pox, requires active counter-irritation and revulsion; and the means recommended for this purpose (§ 79.) to be decidedly enforced. The observations I have already made respecting the use of inhalation (§ 76.) also apply to such cases. When these exanthemata commence with bronchial symptoms, *emetics* are then of decided advantage. And, if they be accompanied with sore throat, purgatives ought to be given in decided doses, the bowels freely acted upon throughout, and enemata occasionally thrown up, particularly F. 140. 149. 794.

84. *d.* When bronchitis occurs in the course of *continued fevers*, the same general principles of treatment are required, as have been specified in respect of scarlatina and measles. In all these states of complication, this disease should be viewed as a marked manifestation, in a particular organ, of the morbid state prevailing more or less throughout the frame; and it should be kept in recollection, that this affection always, in some measure, impedes the changes effected by respiration on the blood, thereby increasing the morbid condition of this fluid existing more or less in all severe cases of exanthematous fevers, and at least the disposition to it that obtains even in simple continued fever. The extent to which depletion should be carried in this complication, or the propriety of employing it at all must depend upon the character of the fever, of the prevailing epidemics, and the particular symptoms and circumstances of the case. I have seen a strong, and regular-living man, with fever thus complicated, very dangerously depressed by a single small depletion. Purgatives are, however, better borne, particularly when combined with camphor or ammonia; and occasional large doses of calomel combined with camphor, and followed in a few hours by a cathartic draught, will be found of much service in promoting the functions of the liver, and enabling it to remove those elements from the blood, which so readily accumulate in it to a hurtful extent, when their elimination by the lungs is impeded. Much advantage will also arise from the use of blisters applied for a few hours, and often repeated; from the use of the rubefacient liniments above specified; and from the inhalation of the vapour of warm water, with a solution of camphor in vinegar added to it.

85. *d.* The association of the sthenic form of bronchitis with *tracheitis* and *laryngitis*, either affection preceding the other, requires full depletion, general or local, or both; large and repeated doses of calomel, with antimony; the tepid or warm bath, semicupium; internal and external revulsion, by cathartics, purgative enemata, &c.; emetics, particularly when the paroxysms of suffocation and stridulous respiration are urgent; the inhalation of watery, emollient, and anodyne vapours; and a free use of diluents, emollients, &c., with the sub-carbonate of soda, the sulphuret of potash, small doses of the sulphuret of ammonia, or of the sulphuret of copper, in extreme cases, until nausea or vomiting is occasioned, &c. Blisters are seldom of much service in this state of disease, particularly whilst the symptoms of croup are present. They ought never to be applied over the throat, as occasionally directed, and, in some cases, not without mischief; although recovery has taken place in others, notwithstanding the risk they occasioned of increasing the local irritation.

86. *e.* One of the most frequent complications presented to us in practice is that of bronchitis with *hooping cough*. In some cases, this complication commences with the usual symptoms of catarrh, on which those of bronchitis supervene; the characteristic signs of hooping cough, particularly the convulsive fits of coughing, with the

inspiratory whoop, and vomitings, not appearing for some days subsequently. In other cases—and those, perhaps the most numerous,—the inflammatory affection has not appeared until after the invasion of pertussis. When thus associated, bronchitis may be either sthenic or asthenic; the one or the other being more generally prevalent in some seasons than in others. During the years specified above (§ 83.), the asthenic state was most common; and I have seen several cases in which sanguineous depletion had been injudiciously practised, particularly as respects quantity. Cerebral symptoms are apt to occur during this complication, and also infiltration or hepatisation of a part of the substance of the lungs. These unfavourable terminations should be anticipated and prevented by small local depletions, — by leeches applied behind the ears; by the exhibition of camphor combined with ipecacuanha or antimonials, and narcotics, particularly conium or hyoscyamus; by diaphoretics with diuretics; and more especially by the use of the liniments and revulsants already recommended (§ 79.). (See Hooping Cough.)

87. *f.* The simultaneous occurrence of inflammatory action in both the *digestive* and respiratory mucous surfaces is not infrequent, particularly in children; and means calculated to benefit the one, generally aggravates the other, or risks the accession of cerebral disease. I have found small local depletions, followed by the pulv. ipecacuanhæ comp., combined with small doses of calomel, or hydrarg. cum creta and camphor; the warm bath and frictions, with the stimulating liniments already specified (§ 79.); the application of blisters for a few hours only, and often repeated; the liq. ammoniæ acet., with spirit. æther. nit., camphor mixture, diuretics, &c., constitute the principal means of cure.

88. *g.* The association of *hepatic disorder* with bronchitis is not rare. But the affection of the biliary organs does not always precede the bronchial disease: it often occurs in its progress; an increased, as well as a morbid, secretion of bile supervening, probably in consequence of the vicarious increase of function of the liver, and its irritation by, and elimination of, the morbid elements accumulated in the blood owing to the impeded function of the lungs. This complication requires the use of mercurial purges combined with camphor and antimony, particularly James's or kermes powder (F. 637.); external irritants and revulsants, cathartic enemata (F. 151.), &c. A similar treatment is indicated when the disease is connected with the translation of erysipelas, gout, or rheumatism.

89. *h.* If the inflammation extend to the *substance of the lungs or pleura*, the antiphlogistic treatment should be rigorously enforced: the solution of tartarised antimony ought to be given in frequent doses, and carried as far as circumstances will permit; internal and external revulsants resorted to at the same time; and diaphoretics and diuretics suited to individual cases prescribed. In some instances, either *colchicum* or *digitalis*, or both, may be substituted for the antimony; but they answer better, particularly the digitalis, after this medicine has previously been used. If we have reason to suppose that *effusion of serum* has taken place in the thoracic cavities, diuretics, and, amongst others, digitalis, should be employed; recollecting, however, that the accumulative and sinking effects of either digitalis or colchicum sometimes appear very rapidly, and in an alarming degree, when they are given either at the same time or after the exhibition of tartarised antimony. Disease of the brain or its membranes supervening in the course of bronchitis has been considered in the article Brain (§ 186.).

90. The sub-acute form of bronchitis requires in all respects the same treatment as the acute uncomplicated disease, but not carried so far; the activity of the means should have due relation to the acuteness of the attack, and the effects they produce.

91. 2d. Of Chronic Bronchitis.—M. Broussais has very justly stated the indications of cure in chronic bronchitis to be, 1st, to diminish the general excitability, and to keep the circulation quiet; 2d, to solicit the excitement and the fluids to other organs, particularly towards the skin; and, to these I would add a 3d, namely, to restore the healthy tone and functions of the bronchial surface, by means which seem to have this effect either directly or indirectly. It is obvious, however, that the accomplishment of the first and second intentions have an indirect influence in bringing about the third.

92. *a.* General *blood-letting* is inadmissible in this state of the disease; and even local bleedings should in many cases be employed with caution. Cupping, however, to a moderate extent, is very frequently required; and it is evidently more advantageous to repeat the operation to a small extent, than to abstract a large quantity at once. When the disease has existed long, and is attended with a copious discharge, much general debility, and absence of pain upon full inspiration, even local depletion cannot be ventured on. Next in importance to depletion is *counter-irritation;* and for this purpose several means are presented to us. When there is a tendency to acute action, or when the cough is at all painful, and the sputum puriform, either the tartarised antimonial ointment, or a large issue or seton in the side, is preferable; but when there is very marked relaxation of the bronchial mucous surfaces, blisters, and rubefacients, or a succession of them, seem more appropriate. I have, however, found, in a number of cases, the *liniments,* No. 296, 297. 311. in the Appendix, productive of much greater advantage, and more generally applicable, than either blisters or the ointments. They may be employed once or twice daily. The vapour arising from them, and diffusing itself around, has also a direct and beneficial effect, by being inhaled, upon the diseased mucous membrane. M. Broussais is very favourable to the use of *setons* and *issues;* and I have seen several instances of marked benefit from them, particularly in the obstinate state of the disease which simulates tubercular phthisis. He also recommends warm cataplasms to the chest, made rubefacient by the addition of mustard. I have seen advantage produced by warm bread and water poultices applied over blistered surfaces, and the seats of issues formed by the mezereon bark, and by the same kind of poultices, to each of which one or two table-spoonsful of the nitro-muriatic lotion (F. 834.) had been added. But it is chiefly early in the chronic disease, or when it has recently passed into this state from the acute, that issues and setons prove successful. They exhaust the energies of the system too

much to be of service in the latter stages, or when the discharge from the lungs is profuse, and the vital energies much depressed.

93. *b. Expectorants* have been much employed in this state of disease; and though more appropriate in it, than in the acute, they are often hurtful from their too exciting operation on the vessels of the bronchial surface. This is especially the case with squills, ammoniacum, and senega, which ought to be used with much caution, and never whilst the sputum is purulent, and pain or soreness complained of in the chest, with fever, heat of skin, &c. The best expectorants are those which are also astringent, or at least not very heating: amongst these, the *sulphate* or *oxide of zinc*, with small doses of myrrh or galbanum, and extract of *conium;* or small doses of *sulphate of quinine*, or of the *sulphate of iron*, with *ipecacuanha* and opium; or the *sulphuret of potash*, and the *Balsamum Sulphuris* (F. 21, 22.), are the most eligible, when the state of the expectoration, of the skin, and pulse, indicates the propriety of having recourse to tonic expectorants. *Opium* has been too much reprobated in cases of this description, as well as in acute bronchitis, owing to the dogma that it suppresses expectoration. I believe, however, that, when judiciously combined, particularly with ipecacuanha, with the muriate of lime, or either of the sulphates of potash, of alumina, or of zinc; or with the nitrate of potash; with camphor, with kermes mineral, or James's powder, according to the circumstances of the case, it is a valuable medicine; and that the diminution of the expectoration produced by it, and which has been unaccountably dreaded, is, when it occurs, a consequence of its changing the morbid state of the vessels forming the excreted matter. If it be the object — as necessarily follows from the doctrine of some writers — to preserve a copious and free expectoration in this disease, how can it ever be cured? Frequently have I seen this end pursued, as if it constituted all that was required, and squills, ammoniacum, senega, &c. given accordingly; and the more abundant and easy the expectoration thereby produced, the more rapidly did the powers of life give way, or complete hectic, with all its attendants, manifest itself. The following have proved serviceable when the pulse was soft, and not remarkably frequent; the skin cool and moist; the sputum very abundant, and consisting chiefly of mucus; and the weakness and emaciation considerable: —

No. 71. Pulv. Ipecacuanhæ gr. j.; Camphoræ rasæ gr. ss.—j.; Extr. Conii gr. iv.—vj.; Mucil. Acaciæ q. s. M. Fiant Pil. ij. ter die capiendæ.

No. 72. ℞ Zinci Sulphatis gr. vj.; Massæ Pilul. Galban. Co. ℈ j.; Extr. Conii ʒ ss.; Syrup. q. s. M. Fiant Pilulæ xij., quarum capiat unam tertiis horis.

No. 73. ℞ Pulv. Ipecacuan. Comp. gr. xxv.; Quininæ Sulphatis gr. vj.; Pulv. Acaciæ ℈ j.; Extr. Lactucæ ℈ j.; Syrup. Papaveris q. s. M. Fiant Pilulæ xviij., quarum capiat binas ter quotidiè.

No. 74. ℞ Quininæ Sulphatis gr. vj.; Pulv. Ipecacuanhæ gr. iv.; Camphoræ rasæ gr. iv.; Opii Puri gr. vj.; Pulv. Rad. Glycyrrh. (vel Extr.) ʒ ss.; Mucilag. Acaciæ q. s. Misce benè, et fiant Pilulæ xx., quarum capiat binas ter quaterve quotidiè.

No. 75. ℞ Balsam. Sulphuris ʒ ss.; Pulv. Ipecac. gr. vj.; Extr. Conii ℈ ij.; Pulv. et Mucilag. Acaciæ q. s. M. Fiant, secundum artem, Pil. xx., quarum capiat binas quartâ quâque horâ.

No. 76. ℞ Solut. Muriatis Calcis ♏ xx.—xxxv.; Mist. Camphoræ ʒ x.; Tinct. Opii Comp. (F. 729.) ♏ x.—xx.; (vel Tinct. Camphoræ Comp. ʒ jss.) M. Fiat Haustus ter die capiendus.

94. *c.* In cases of this description, any of the formulæ given under the head *Balsams*, in the Appendix, may be employed. Dr. ARMSTRONG strongly recommended the balsam of copaiva in chronic bronchitis; but it is seldom beneficial, and is certainly inferior to the other balsams and terebinthinates in this affection (F. 486, 487. 538. 571.). In the more advanced stages of chronic bronchitis, particularly when the colliquative sweats or diarrhœa occur, the most essential benefit has been derived from the following mixture, in several cases in which I prescribed it; but even where the bowels are regular, I have found it by no means productive of costiveness. At the time that I was giving this medicine to the third patient on whom I had tried it, a case, showing the success of a nearly similar treatment, was published by Dr. HASTINGS (*Midland Med. Repor.* vol. ii. p. 376.), — a coincidence fully evincing the propriety of the practice.

No. 77. ℞ Mist. Cretæ ℥ vjss.; Vini Ipecac. ʒ jss.; Tinct. Opii ʒ j.; (vel Tinct. Camphoræ Comp. ʒ vj.); Syrup. Tolutan. ʒ iij. M. Capiat Cochlearia duo larga ter quaterve in die.

The cretaceous mixture will often be of service when used alone, or with a little of the muriate of lime, or with the addition of mucilage, or of hyoscyamus, or conium, or extr. lactucæ, or the extr. papaveris, according to circumstances. In this state of the disease, also, I have seen *sulphur* given with advantage in mucilaginous electuaries. Dr. L. KERCKHOFFS states, that he has administered it with success, in conjunction with the powder of the white willow bark. M. BROUSSAIS relies chiefly upon *mucilages* and demulcents, combined with ipecacuanha and opium, and certainly with great justice. (See F. 284, *et seq.*). The extr. lactucæ, as recommended by Dr. DUNCAN, may occasionally be substituted for the opium. The decoctions of *Iceland moss*, and the infusions of *conium*, of *marrubium*, of the *uva ursi*, or of the *melissa* (F. 230. 237, 238. 245. 267.), with mucilages, anodynes, and ipecacuanha, are also very serviceable. I have given the preparations of *iodine* in a few cases, in small doses; and, in some instances, especially when there was little or no febrile action, nor much emaciation, benefit appeared to be derived from them.

95. *d.* When the disease is attended with dyspnœa, and profuse or difficult expectoration, *emetics* are of great, although often of temporary advantage, particularly in aged persons. Ipecacuanha, or sulphate of zinc, with the addition of diffusive stimulants (F. 402.), are the most appropriate in the majority of cases. After their operation, and if the strength be not very much reduced, the *digitalis* or *colchicum* may be prescribed, in conjunction with diuretics and gentle astringents (F. 203.). These active medicines are chiefly suited to the more febrile states of the disease, or when soreness or slight pain of chest are complained of, with a puriform expectoration; and are best combined with small doses of blue pill, camphor, and opium, — with pectoral *infusions* and *mixtures* (see App. F. 244. 426. 497.) with demulcents (F. 389.), and with diuretics (F. 194, 195. 236, 237.). Dr. HASTINGS recommends a combination of digitalis and colchicum; but I have seen more harm than benefit occasioned by it in some cases of chronic bronchitis, — a result which might, *à priori*, be expected from the associated operation of two most depress-

ing medicines, given in a state of disease characterised by irritative, rather than by acute, vascular action. I have found them most beneficial when exhibited singly with diuretics, or diaphoretics, in the chronic forms of bronchitis consecutive of exanthematous fevers (§ 54.); sometimes resorting also to the warm bath, followed by frictions of the surface with the liniments F. 297. or 311. The combination of colchicum and digitalis, in small or moderate doses, has proved more serviceable, in my practice, in tubercular disease of the lungs, or when bronchitis has been complicated with tubercles. In cases where the propriety of giving these medicines is doubtful, a combination of them with the alkalies, or their carbonates, and with tonic infusions or decoctions, or F. 515—517., or the following, may be prescribed: —

No. 78. ℞ Pulv. Colchici (vel Pulv. Digitalis) gr. j.—ij.; Massæ Pilul. Hydrarg. gr. ij.; Massæ Pilul. Galban. Comp. gr. v.; Extr. Opii gr. ss.; Syrup. q. s. M. Fiant Pil. ij. bis terve quotidiè sumendæ.

No. 79. ℞ Infus. Uvæ Ursi ʒ xij.; Acidi Sulph. Dil. ♏ xx.; Tinct. Digitalis ♏ x.—xv.; Tinct. Camphoræ Comp. ʒ j.; Syrup. Papaveris ʒ ss. M. Fiat Haustus, bis tervè in die sumendus.

No. 80. ℞ Sodæ Sub-carbon. (vel. Liq. Potassæ) ʒ j.; Infus. Calumbæ (vel Decocti Cinchonæ) ℥ vj.; Tinct. Colchici Semin. ʒ j.—ʒ jss.; Tinct. Digitalis ♏ xxx. M. Capiat Coch. ij. larga ter in die.

No. 81. ℞ Mist. Diosmæ Crenatæ (F. 396.) ℥ vss.; Tinct. Digitalis ♏ xxxv. (vel Tinct. Semin. Colchici ʒ j.—ʒ ij.); Extr. Conii gr. xxvj. (vel Extr. Lactueæ ʒ ss.); Syrup. Tolutan. ℥ ss. M. Fiat Mist., cujus sumat Coch. ij. larga ter quaterve in die.

No. 82. ℞ Pulv. Acaciæ ʒ ij.; Mist. Amygdal. Dulc. et Camphoræ āā ℥ iijss.; Acidi Hydrocyanici ♏ vj.—xij; Spir. Æther. Sulph. Comp. ʒ ij.—iij.; Oxymellis Scillæ ℥ ss. M. Coch. ij. vel iij. larga ter in die.

96. *Prussic acid* is often of much service in the chronic forms of bronchitis, especially in their *complications* with disorder of the digestive organs, and may be exhibited with demulcents, gentle tonics, astringents, or expectorants, or as prescribed in the Appendix (F. 344. 858.). When the disease is associated with derangement of the hepatic functions, or even of the stomach and bowels, it will be necessary to give small doses of blue pill, or of the hydrarg. cum creta, with deobstruents and gentle tonics; and, on some occasions, full doses of calomel from time to time, either alone, or in suitable forms of combination, followed by a purgative.

No. 83. ℞ Pilul. Hydrarg. gr. vj. (vel. Hydr. cum Creta gr. xviij.); Pulv. Ipecacuanhæ gr. viij.; Extr. Sarsæ et Ext. Taraxaci āā ʒ j.; Gum. Assafœtidæ et Saponis Castil. āā ℈ j. M. Fiant Pilulæ xlviij., quarum capiat binas ter quaterve in die.

No. 84. ℞ Hydrarg. Submur. gr. vj.; Kermes Mineral. gr. xij.; Camphoræ rasæ gr. xij.: Extr. Taraxaci ʒ ijss.; Extr. Humuli ʒ jss. M. Divide in Pilulas lxiv., quarum capiat ij. vel iij. ter quaterve in die.

97. The treatment which has been already recommended for *Humoral* Asthma (*see particularly* § 100, *et omn. seq.*), and the tonics and astringents, especially the sulphates of zinc, iron, or quinine, already noticed (§ 93.), are applicable, with but little variation, to the more chronic and humoral states of the disease, especially in persons advanced in life, and in children, when it has assumed a chronic form after hooping-cough and the exanthemata. I have also occasionally seen benefit derived, in these states of chronic bronchitis, from the *chlorate of potash*, given to adults, in from two to six grains, three or four times a day. This medicine was often prescribed by myself and one of my colleagues, at the Infirmary for Children, during the years 1826—1828, and subsequently, in the more chronic forms of bronchitis, and in various disorders of debility; in which latter it was generally beneficial: but little advantage was frequently derived from it in this disease, unless in those forms of it now mentioned, where it was often of great use, particularly when the morbid action seemed connected with deficient tone of the bronchial vessels, and of the system generally. Mr. Murray, in a recent publication, states, that he has employed it successfully in consumption, — a name which has usually comprised most of the cases of this form of bronchitis.

98. *e. Inhalations* of medicated or tar vapours have been recommended by Crichton, Pagenstecher, Hufeland, Forbes, Hastings, Elliotson, Gannal, and others noticed in the article on *Asthma*, and been disapproved of by some. I believe that they have frequently been used in too concentrated a state; or too much of the vapour has been diffused in the respired air, occasioning irritation of the bronchial membrane, instead of a gently tonic and healing effect. Whenever any of the vapours advised in this disease produce an increase of the cough, either its use should be left off, or its strength greatly reduced. The manner of having recourse to such vapours, as well as the choice of substances emitting them, have not, in my opinion, always been judicious. The tar vapour is occasionally of service, chiefly from the quantity of turpentine it contains; while the acrid empyreumatic fumes which it also emits, counteract whatever good effect the former constituent might produce. Would it not, therefore, be preferable to try the effects of the substance from which the advantage is obviously derived? I have done so in a few cases of this disease, and seen marked benefit result from it; and therefore recommend it to the notice of other practitioners. In former times, medication by fumigations and vapours was much resorted to; and it is probable, that the early use of incense and various balsamic and aromatic fumes in religious rites had some relation to their prophylactic effect against disease, or even to their curative influence; the more especially, as the priests of antiquity also exercised the healing art. In several of the productions attributed to Hippocrates, the inhalation of vapours and fumes of various resinous and balsamic substances is recommended; and a number of writers in the 16th, 17th, and 18th centuries, have advised a nearly similar method, and employed camphor, benzoin, amber, frankincense, myrrh, storax, assafœtida, sulphur, cloves, the balsams, &c. for this purpose. This practice was employed by Benedict (see his *Theatrum Tabidorum*) in consumptive diseases: and Boerhaave gives several formulæ, in his *Materia Medica*, for fumigations with the above substances. Mead, in his *Monita et Precepta*, offers several judicious remarks on this subject. He observes — "that fumigations with balsamics, &c. is of vast service in some cases: which is to be done by throwing the ingredients on red coals, and receiving the fumes through a proper tube directed to the windpipe." After noticing the undeserved neglect of this practice, and the propriety of thus applying medicinal substances directly to the seat of disease, he states, that the smoke of the balsam of Tolu conveyed into the lungs, or the smoking this substance like tobacco, is of signal service in

diseases of this organ. (p. 58.) It appears from the writings of FRACASTORI that the fumes of *cinnabar* were much employed by inhalation in the treatment of the constitutional forms of syphilis, at an early period of the history of that disease, when it assumed a pestilential form.

99. Notwithstanding the unsuccessful attempts of BEDDOES to revive the practice, by employing the elementary and permanently elastic gases, but according to views too exclusively chemical, the practice of inhalation has long been neglected, or undeservedly fallen into the hands of empirics. Very recently, however, it has been brought again into notice by M. GANNAL, Mr. MURRAY, and Sir C. SCUDAMORE; and *chlorine gas,* the fumes of *iodine,* and watery vapour holding in solution various *narcotics,* have been recommended to be inhaled. I have tried those substances in a few cases of chronic bronchitis; but in not more than two or three cases of tubercular phthisis. The chlorine was used in so diluted a state as not to excite irritation or cough. The sulphuret of iodine, and the *liquor hydriodatis potassæ concentratus* (F. 328.) were also employed; one or two drachms of the latter being added to about a pint of water at the temperature of 130°, and the fumes inhaled for ten or twelve minutes, twice or thrice daily. The tinctures or extracts of hyoscyamus and conium, with camphor, added to water at about the above temperature, were likewise made trial of; and, although the cases have been few in which these substances have been thus used by me, yet sufficient evidence of advantage has been furnished to warrant the recommendation of them in this state of the disease.

100. *Inhalations* also of the fumes of the *balsams,* of the *terebinthinates,* of the odoriferous *resins,* &c. are evidently, from what I have seen of their effects, of much service in the chronic forms of bronchitis: and I believe that they have fallen into disuse, from having been inhaled as they arise in a column or current from the substances yielding them, and before they have been sufficiently diffused in the air. When thus employed, they not only occasion too great excitement of the bronchial surface, but also intercept an equal portion of respirable air, and thereby interfere with the already sufficiently impeded function of respiration. M. NYSTEN has shown (*Dict. des Scien. Méd.* t. xvii. p. 143.) that ammoniacal and other stimulating fumes, when inhaled into the lungs in too concentrated a state, produce most acute inflammation of the air-tubes, generally terminating in death; and refers to a case in which he observed this result from an incautious trial of this practice. I conceive, therefore, that the vapours emitted by the more fluid balsams, terebinthinates, the resins, camphor, vinegar, &c., and from chlorine and the preparations of iodine, should be more diluted by admixture with the atmosphere, previously to being inhaled, than they usually are. According to this view, I have directed them to be diffused in the air of the patient's apartment, regulating the quantity of the fumes, the continuance of the process, and the frequency of its repetition, by the effects produced on the cough, on the quantity and state of the sputa, and on the respiration. The objects had in view have been gradually to diminish the quantity of the sputum, by changing the action of the vessels secreting it; without exciting cough, or increasing the tightness of the chest, or otherwise disordering respiration. From this it will appear, that the prolonged respiration of air containing a weak dose of medicated fumes or vapours, is to be preferred to a short inhalation of them in their more concentrated states. The want of success which Dr. HASTINGS and others have experienced, evidently has been partly owing to the mode of administering them, and partly to having prescribed them inappropriately. When the patient complains of acute pain in any part of the chest, as in some of Dr. HASTINGS's cases, they are as likely to be mischievous as beneficial. Where benefit has been obtained, it will be found that it was when the fumes of the more stimulating of those substances were diffused, in moderate quantity, in the air of the patient's apartments; or when he passed, at several periods daily, some time in a room moderately charged with the vapour or fumes of the substance or substances selected for use. (*See the remarks on Inhalation in Humoral* ASTHMA, § 88. *for an account of various medicines that may be employed in this manner.*)

101. *f. Sponging the surface of the chest,* and trunk of the body, first with tepid, and afterwards with cold lotions, has often been practised by me with advantage in several states of this disease. When the expectoration has been profuse, the debility great, and little or no febrile heat present, I have preferred for this purpose the nitro-muriatic acid lotion (F. 834.), in a warm or tepid state, night or morning, or both. When the disease is more active, the habit of body being, nevertheless, relaxed and debilitated, a solution of common salt in water, or the lotion, ℞ 54., seems preferable; and the directions given respecting this treatment in the article ASTHMA (§ 116, 117.) should be strictly followed. I have observed much benefit derived from the application, for a considerable time, of one of the plasters, F. 111. 115. 118, 119., between the shoulders; whilst cold sponging the anterior of the trunk with the lotions referred to has also been directed.

102. *g.* The *complications of chronic bronchitis* require generally no particular modification of treatment from that now detailed: indeed, some of them have been already noticed. I may, however, add, that, in the chronic asthenic states of the disease frequently met with in aged persons, and often occurring in children after exanthematous diseases, hooping-cough, and bowel complaints, the flowers of *sulphur,* the preparations of *zinc,* the oxide of *bismuth,* and the *chlorates* of *potash* and of *lime,* have severally been of great service, especially when combined with narcotics — with opium in the aged, and conium in the young; — their constipating effects upon the bowels being duly obviated by the occasional exhibition of purgatives. The chronic bronchitis complicated with, or consecutive of, hooping-cough, the characteristic cough of the latter either still continuing, or having altogether disappeared, is frequently attended with *dilatation* of the bronchi. In these cases, balsams, inhalation, the use of tonics, particularly the sulphate of iron, quinine, the liniments already noticed, frequent doses of sulphur, or moderate doses of

the chlorate of potash, are required. If the child be not very young, either of these latter may be combined with belladonna, or with conium, and given in honey or syrup of squills; or with simple syrup, sugar, powdered liquorice root, or with the compound tragacanth powder. When the disease is associated with chronic irritation of the mucous surface of the bowels, the chlorate of lime will be of much service, and will soon restrain the latter affection; the use of the *liniments* already recommended (F. 296. 311.), in addition, generally contributing to cure the bronchial disease. Either of these liniments has often been sufficient of itself to remove all disorder, both in the consecutive states, and in the different complications noticed at this place; and, when bronchitis seems to have a tendency to terminate, or has actually terminated, in effusion, they have powerfully assisted the treatment. When, however, dropsies supervene, in addition to them, colchicum or digitalis, with astringent tonics; squills, with blue pill, taraxacum, or extract of sarsaparilla; the preparations of *iodine,* alone or with narcotics; supertartrate of potash, with the sub-borate of soda, particularly this last; and various other diuretic and deobstruent medicines in different forms of combination — of which numerous examples are given in the *Appendix* — and the general plan of treatment recommended in the article DROPSY; should be employed.

103. *C. The regimenal treatment* of bronchitis requires strict attention. — *a.* In the *sthenic acute* disease it should be strictly antiphlogistic; and, at the commencement of convalescence, a farinaceous diet adopted, until out-of-door exercise may be taken, or shortly before. In the *asthenic states* of acute bronchitis, this regimen is chiefly applicable to the commencement of the disease: subsequently, nourishment in small quantities, suited, in kind and frequency of partaking of it, to the state of the symptoms, the powers of the digestive organs, and feelings of the patient, should be permitted; and even animal food of a digestible nature, in moderate quantity, may in some cases, particularly in the aged, be permitted once a day. The decoction of Iceland moss, jellies, mucilaginous and emollient soups; shell-fish; the different kinds of white fish, dressed either with sweet oil or the oil obtained by boiling their fresh livers; the lighter kinds of animal food; and, in the case of infants, attention to the milk of the mother, or a healthy wet-nurse; are all occasionally of service during early convalescence from the *acute* forms of bronchitis, and in the progress of the more febrile states of the *chronic* disease. In the more asthenic cases of this latter, or when the expectoration is profuse, the skin cool and moist, and the habit of body lymphatic, relaxed, or wasted, animal food, especially fresh beef or mutton, underdone, and in moderate quantity; new-laid raw eggs; or a due proportion of digestible and stimulating food; will be found most serviceable. In nearly all the *chronic* states of the disease, particularly in their advanced stages, a light nutritious diet is necessary.

104. *b.* The patient's *beverage* should receive particular attention. Lemonade, imperial, barley-water, and the cooling and aperient drinks prescribed in the Appendix (F. 588—595. 916.), should be employed in the sthenic form of the acute disease. In the asthenic and chronic states, the red Bordeaux wines, or the wines of Burgundy — the former generally reduced by one third or one half water; or beer or ale, also reduced, to which a little of the liquor potassæ, or of Brandish's alkaline solution, has been added, may also be tried at meals; and either of these, or of the more cooling beverages, adopted, that may be found to agree best with the patient. If the disease evince a disposition to terminate in dropsy, the imperial drink, with the addition of a little borax, or F. 590, 591., will be most serviceable. In the advanced period of *chronic,* or during convalescence from *acute,* bronchitis, the sulphureous mineral waters will often be beneficial. Those of Harrowgate, Leamington, or Moffat, may be tried; or of Enghein, Bonnes, Barèges, or Cauterets (ROCHE); or the artificial waters of Ems or Carlsbad.

105. *c.* Few diseases are more benefited than chronic bronchitis by *change of air.* A residence on the southern coast, particularly at Torquay, and in various other parts of Devonshire, during the winter and spring months, guarding against vicissitudes of climate, — which, however, is milder and less variable in this part of the island than any where else; wearing flannel next the skin, especially during winter and spring; gentle exercise on horseback, or the use of the swing; and constant attention to the state of the bowels; are severally of great importance. During the progress of convalescence, as well as in the earlier stages of disease, particularly if the secretion from the bronchi continue, it will be necessary to resort occasionally to an emetic; and in a day or two subsequently, notwithstanding the bowels may be freely open, to an active cathartic. In these cases, the addition of a vegetable bitter or tonic to a purgative medicine, — as the sulphate of quinine to aloes, or the infusion or extract of gentian to senna, — will have a decidedly cathartic operation, without lowering the energies of the frame. There are few diseases more benefited, either in their progress or decline, than those now discussed, by active purging; but it will often be requisite to combine the purgatives with stimulants or tonics, in order that an active or continued operation on the bowels may not exhaust the patient. During convalescence, the free use of purgatives requires a liberal and invigorating diet.

106. V. DILATATION OF THE BRONCHI. — The *anatomical characters* and *physical signs* of this change of the bronchi have been already described (§ 19.). It is almost entirely a consequence of, or an attendant upon, the more chronic cases of bronchitis, or of hooping-cough complicated with bronchitis. The expectoration, besides being copious and puriform, is often fœtid, — a diagnostic symptom of this alteration, without which, M. LOUIS, and other pathologists, who have devoted much attention to pulmonary diseases, have sometimes failed of distinguishing it from phthisis.

107. The TREATMENT of this alteration is nearly the same as that which has been recommended in the more chronic states of bronchitis. The means which are especially indicated consist of the *inhalation* of balsamic and terebinthinate fumes; of those of chlorine, iodine, &c. (§ 99, 100.); the internal use of balsams, tonics, and bitters, particularly the sulphates of quinine, or of zinc, or iron;

and other preparations of cinchona or steel; with the use of the liniments already noticed (§ 102.); or the nitro-muriatic lotion on the chest. The chlorate of potash, or of lime, seems indicated in this form of the disease. An open state of the bowels, an occasional cathartic, nutritious diet, and change of air, are also evidently required. In other respects, the treatment already detailed (§ 101, *et seq.*) may be followed; or modified according to the peculiarities of the case.

108. VI. ULCERATION OF THE BRONCHI (see § 7, 8.) is another alteration which is produced by, or is attendant on the advanced stages of, chronic bronchitis; most frequently, however, when complicated with tubercular phthisis. It is not infrequently met with, particularly after bronchitis occasioned by the mechanical irritation of mineral, vegetable, or animal molecules. The existence of ulceration, when seated in the bronchi, is not indicated by any sign in addition to those which accompany the most chronic states of bronchitis, or tubercular disease, when it arises from, or is complicated with, this change. When affecting the LARYNX or TRACHEA (see these articles), it may frequently be suspected, or occasionally prognosticated. In a case which occurred in the trachea, a prognosis to this effect was given by me long before death.

109. The TREATMENT of this lesion, even could its existence be ascertained during life, cannot be different from that required in some other states of chronic bronchitis. That ulceration may take place in the bronchi, and heal, as evinced by the appearance of cicatrices, has been ascertained by M. LAENNEC, and other pathologists. In addition to the means of cure already described, the establishment of local drains of the most active kind is obviously required. Blisters and issues applied to a distant part have not been found of use by M. LAENNEC. He prefers the repeated application of small moxas as near the seat of disease as possible, and the preservation of absolute rest and silence. The inhalation of emollient, anodyne and balsamic vapours and fumes may likewise be tried; and, if the disease be devoid of marked febrile excitement, the expectoration abundant, and the powers of life consequently reduced, the treatment advised for dilatation of the bronchi (§ 19.) may be employed in all its parts. (For the *treatment* of other organic changes of the air-passages, see arts. CROUP, LARYNX, LUNGS — *Hæmorrhage from*, and TRACHEA).

VII. BRONCHIAL FLUX.— *Bronchorrhœa* (from Βρόγχος and ῥεω.) SYN. *Bronchorrhée* (Roche). *Catarrhe Pituiteux* (Laennec). *Mucous Flux.*

CLASSIF. I. CLASS, III. ORDER (*Author*).

110. DEFIN. *A flux of watery mucus, or phlegm, from the chest, with more or less cough, but without fever; frequently occasioning exhaustion.*

111. This affection varies considerably. It is often a variety of chronic bronchitis; being consecutive of it in persons advanced in life, or those of a relaxed and phlegmatic or pituitous habit of body. In other cases it appears from the commencement, or consecutively of slight catarrh, as intermediate between chronic bronchitis and humoral asthma. This appellation may, upon the whole, therefore, be viewed as applicable to those cases which are attended with a more abundant, fluid, and transparent expectoration, than is observed in chronic bronchitis, and are devoid of fever and all other signs of inflammatory action; whilst they are equally without the severe dyspnœa, the paroxysms of suffocation and cough, and the intermissions, characterising humid asthma.

112. Bronchorrhœa proceeds generally from similar *causes* to those which produce common catarrh, or bronchitis, even although it be not consecutive of some one of the forms of bronchial inflammation. It is very frequently, either at its commencement, or recurrence, connected with cold and moist states of the atmosphere, or occasioned by exposure to cold in some one or other of its forms. When it occurs as a sequela of bronchitis, it may be viewed as arising from lost tone of the vessels and of the bronchial surface, the flux or determination to this part still continuing, from peculiarity of habit or some other cause, after all inflammatory and febrile symptoms have been removed. Thus it is very frequent in aged persons of relaxed fibres, who have experienced repeated attacks of pulmonary catarrh.

113. *Diagnostic symptoms.* — Bronchorrhœa may be distinguished from chronic bronchitis, tubercular phthisis, and humoral asthma, by the following characters: — The quantity of fluid expectorated is very great; being, in some cases, as much as four or five pounds in the twenty-four hours. The sputum is colourless, ropy, transparent, slightly frothy on the surface, and resembling the white of egg mixed with water. It is without the thickened sputa generally accompanying chronic bronchitis. There is considerable dyspnœa, but the chest sounds well throughout upon percussion; and the cough is slight comparatively to the quantity of the expectoration, being evidently no more than is occasioned by the discharge of the secreted fluid. The pulse and temperature of the skin are natural, and there are no night sweats. The appetite is generally unimpaired; and emaciation is not remarkable, or not at all observed, unless the quantity of the sputum be extremely great. M. NAUCHE states, that the expectoration in this state of disease is always more or less acid, and reddens turnsole paper, whilst that proceeding from inflammatory action restores the blue tint to this paper after being reddened by acids. *On auscultation,* the respiratory murmur is commonly weak, but is very rarely suspended. The sibilous rhonchus is heard more or less distinctly, and often mixed with the sonorous, and occasionally with the mucous rhonchus, the bubbles of which seem to burst upon the surface of a fluid of less consistence than in bronchitis.

114. Bronchorrhœa usually commences with catarrhal symptoms, and frequently without fever. In other cases, after bronchitis has continued chronic for a longer or shorter period, the expectoration becomes less consistent and less opaque, more abundant, and similar to that described; and the affection becomes established, — aggravated at times by disorder of the stomach or bowels, or by changes of the air, especially by cold and moisture, or by arrest of the cutaneous transpiration from any cause, — and ameliorated at other times by a warm dry air, an open state of the bowels, and light nourishing diet, taken in

moderate quantity. Vacillating in this manner, the disease may continue for years if it be not severe, without materially affecting the strength. But more frequently the discharge increases, after irregularly prolonged, and more or less slight intervals; the patient loses his flesh, and becomes paler; his strength is impaired; dyspnœa increases; and, in some cases, the affection either runs into humoral asthma, or the quantity of expectoration is augmented so as to exhaust his energies, and to occasion suffocating paroxysms of cough. In rarer cases, the quantity of the bronchial discharge has been so great as to occasion the exhaustion and death of the patient. M. Andral has detailed two cases of this description, wherein, upon *dissection*, no evidence of inflammation or congestion could be found in the air-tubes. M. Roche has described, what he has designated an acute form of this affection, which other French pathologists have named *catarrhe suffocant;* but it differs in no respects from the more humoral states of asthma, described in its more appropriate place, and presenting all the symptoms of spasm of the air-passages, with a copious viscid expectoration; the spasm and other symptoms subsiding after the bronchi and trachea are unloaded of the secretion accumulated in them. Bronchorrhœa has, in rare instances, been the means of removing other diseases. M. Andral states that he has seen hydrothorax disappear after the establishment of a copious bronchial flux.

115. Treatment. — After the full exposition that has been given of the means of cure in the different states of chronic bronchitis, to some of which bronchorrhœa is closely allied, it will be sufficient to enumerate succinctly the various means which are applicable to this affection. As the disease essentially consists of an increased secretion and exhalation from the respiratory mucous membrane, with a determination of the circulation to that quarter, and deficient tone of the vessels distributed to it, the obvious *indications are,* to increase the secretions from other surfaces and organs, thereby to derive from the lungs, and to restore the lost tone of this membrane and its vessels. In some cases, accordingly, it will be advantageous to commence with an ipecacuanha or sulphate of zinc *emetic,* and afterwards to act freely upon the secretions and alvine excretions by purgatives. I have never seen a case of the disease which has not been much relieved by purgatives; taking care, however, that they should not lower the energies of the constitution, by combining them with tonics, bitters, or stimulants, and allowing sufficient light nourishment to admit of this mode of derivation being satisfactorily employed. In the intervals between the exhibition of purgatives, diuretics and diaphoretics may be exhibited, and the cutaneous functions promoted by wearing flannel next the skin during the winter and spring months.

116. *Expectorants* are very much employed in this affection; but some of this class of medicines are seldom of benefit in it, unless combined with opium. The *balsams* and terebinthinates (F. 484—487. 489.); the sulphate of zinc, with myrrh, or the compound galbanum pill; and either of these, with camphor and opium; are often of service. In addition to these, *inhalations,* as recommended in another part (§ 99, 100.), may be employed. Although astringents and inhalations are often required, yet we should be cautious in using them when the disease has been of very long continuance, particularly in persons advanced in age, or when there is any irregularity of the action of the heart, or physical sign of organic change about this organ, complicated with it; inasmuch as the arrest of an habitual discharge will, in such circumstances, risk the supervention of effusion in the cavities of the thorax. It will be more judicious, in these cases, to confide in purgatives combined with bitter tonics; in diuretics, and in diaphoretics, so as to moderate the discharge, and prevent its increase, or its exhausting effects upon the system. At the same time the vital energies should be promoted by a light nutritious diet, moderate exercise, and change of air, with the sulphureous or gently tonic mineral waters. In other cases, where the age of the patient, the regular or healthy state of the heart's action, the absence of leucophlegmasia, and the circumstances of the case altogether, are such as to preclude dread of the consequences of suppressing this discharge, cold sponging the surface of the body by the nitro-muriatic lotion, &c. (§ 101.), and the liniments already noticed (F. 296. 311.), with the internal use of the more astringent tonics, particularly the sulphates of iron or of quinine, in addition to the measures already recommended, may also be practised.

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BRONCHOCELE (from Βρόγχος, throat, and *κήλη*, a swelling). Syn. *Hernia Gutturalis, Gossum, Luftröhrenbruch, Kropf*, Ger. *Goître*, Fr. *Broncocele, Gozzo*, Ital. *Thyrophraxia*, Alibert. *Cynanche Thyroidea*, Conradi. *Goître*, "*Derbyshire Neck.*"

Classif. 4. *Class*, Local Diseases; 6. *Order*, Tumours (*Cullen*). 6. *Class*, Excernent Function; 1. *Order*, Affecting the Parenchyma (*Good*). IV. Class, IV. Order (*Author*, see *Preface*).

1. Defin. *Chronic enlargement of the thyroid gland, sometimes with change in the surrounding parts, generally increasing slowly, often continuing for years, and depending upon constitutional causes.*

2. I. Causes, and Morbid Relations. — This disease is *endemical* in Derbyshire, and some other parts of this country; but most remarkably so in Switzerland, various adjoining districts, and in some places in South America. It usually occurs during the early epochs of life, most frequently about the period of puberty, in persons of a weak and lax fibre, and generally in females; it very seldom being observed in Great Britain in males: but the comparative frequency of it in the latter sex is greater in Switzerland, and other parts where it is very prevalent, and is connected with cretinism. In a considerable number of cases which have come before me in females, I have never met with any before the period of commencing puberty, — not even at the Infirmary for Children; although the menses have often been delayed for a year or two, or even longer, when the tumour has appeared at this epoch; and I have seldom observed an instance in this sex unconnected with some kind of irregularity of the menstrual discharge, or disorder of the uterine functions. In two cases, occurring in married females, who were under my care, unhealthy or irregular menstruation had existed during the continuance of the goître; in one case for eight years, in the other for five: upon its disappearance, pregnancy took place in both. Suppression of the menses has sometimes caused its sudden appearance and rapid developement; and it more rarely has originated during pregnancy and the puerperal states. Authors have adduced conclusive proofs of its occurrence hereditarily, independently of endemic influence.

3. Dr. Good has attributed the disease, in a great measure, to poverty, and the nature of the food: the rich being exempt from it. This is, however, very far from being the case. I have seen several cases of bronchocele in the richest in this metropolis. He is also wrong in attributing it to the use, in Derbyshire, of *oaten cakes*. In Scotland, where this article of diet is in general use, bronchocele is rare.

4. That it chiefly depends upon certain physical causes is shown by its prevalence in certain districts in preference to others, and by the circumstance of its disappearance when persons affected by it endemically have changed their residence. M. Alibert mentions his having seen it disappear after a residence in Paris. It has been very generally imputed to the water used by those affected. Since the time of Pliny, it has been attributed to the use of snow water. But it prevails in several places where this cause does not exist, as in Sumatra, and several parts of South America. The Swiss who drink snow water are free from the disease, while those who use hard spring water are most commonly affected. Captain Franklin states, that at a part in his journey to the Polar Sea, where bronchocele prevails, it is confined to those who drink river water, and that those who use melted snow escape. Mr. Bally ascribes its frequency, in a district in Switzerland, to the use of spring water impregnated with calcareous or mineral substances; and he states, that those who use not this water are free from both goître and cretinism. Dr. Coindet observed that the inhabitants of Geneva, who drink the hard pump waters, are those most liable to bronchocele. Its prevalence in Nottingham is ascribed by Dr. Manson to the same cause; which also seems to occasion it in Sussex and Hampshire, in the valleys of which counties it is frequently met with.

5. That this is, however, not the only cause, may be inferred from other physical circumstances connected with its endemical prevalence. Its great frequency in low, moist, marshy, and warm valleys, and the exemption of the inhabitants of dry and elevated situations, have been shown by Larrey, Fodéré, Saussure, Reeves, Clark, Valentin, Postiglione, and J. Johnson, as respects various districts in Switzerland, the Tyrol, Carinthia, the Vallais, and the north of Italy. Similar facts have been adduced by Dr. Gibson, and Humboldt, in regard to the United States, and South America. It is most probable, however, that the exhalations from the soil of those localities are not the only, but a concurrent cause, cooperating with others possessing equal influence in the production of the disease, and particularly with the nature of the water. But it as certainly sometimes appears where neither of those causes can be traced, as in London; disorder of some kind in the uterine functions being the most frequent morbid relation it has presented, as far as my experience has gone. Its connection with cretinism in the districts on the Continent above alluded to, and the occasional appearance of the disease at very early periods of life — it being even sometimes congenital, in these countries, as well as being more common there in the male sex than in this country — are matters of some interest, and not readily admitting of explanation; since poverty, close, confined, and ill-ventilated apartments, are not the chief causes of those phenomena, as shown by their absence in the poorest classes in this metropolis. Dr. Parry has seen goître follow diseases of the heart, and epilepsy. Flajani has noticed the common occurrence of palpitations and affections of the lungs from the disorder it has occasioned of the respiratory function. When the tumour is very large, or hard, or when it has increased suddenly, it not infrequently occasions most urgent symptoms, by its pressure on the trachea, œsophagus, and jugular veins.

6. As respects the *external and internal appear-*

ances of this tumour, I may briefly observe that it affects generally the whole gland; but is also sometimes confined to the lateral or to the middle lobes: it is more rarely larger on one side than another. At first it is commonly compact, rounded, and equal; but, as it increases, it is either soft and flabby to the touch, or unequal, irregular, hard, and obscurely lobulated. It is usually free from pain, and is not discoloured. When it is greatly increased in size, and is soft, it appears pendulous, chiefly owing to its lower parts being most enlarged. When the tumour is divided, the cells of the gland are found, according to HUNTER, BAILLIE, and B. BELL, filled with a more or less viscid fluid; and are of various sizes, generally from that of a pea downwards, not only in different cases, but even in the same gland. In the older, harder, and more irregular forms of the tumour, melicerous, steatomatous, cartilaginous, and ossific deposits have been met with in parts of it, by CELSUS, DE HAEN, FREYTAG, GIRAUD, HEDENUS, and others. The usual state in which this disease presents itself, obviously, is that of an increased secretion into the cells of the gland, distending them more or less; the other changes sometimes observed, being consequences of obscure irritation induced in parts of it during its continuance or growth.

7. II. DIAGNOSIS. — It is necessary to be aware that other diseases of either a more acute or malignant character may affect the thyroid gland and its vicinity, and be mistaken for bronchocele. 1st, The gland may be either healthy, or but little enlarged; the tumour consisting chiefly of thickened surrounding cellular tissue, sometimes containing cysts filled either with a serous, albuminous, or purulent matter. Large *encysted tumours* may also form in the course of the trachea. But these may be readily distinguished by their situation, form, and fluctuation. 2d, The gland itself may be the seat of *chronic or acute inflammation.* In this case the swelling increases more rapidly, but seldom attains a large size; and is generally attended by redness of its surface, and increased temperature. It is also painful, particularly on pressure, and is very hard. I lately saw a case of this description, in a married female of about thirty, who was also seen by Mr. LLOYD, where the inflammation had proceeded to suppuration, and had terminated in an external opening. I believe that inflammation of the gland never occurs but in scrofulous habits. 3d, The gland may also be the seat of *scirrhus*, which may ultimately go on to carcinomatous ulceration; but this is a rare occurrence. In this case the gland is very hard, seldom large, sometimes scarcely increased in bulk, and is the seat of sharp darting pains. It is only met with in persons advanced in age. ALIBERT states, that he has observed a case of goître pass into cancer; but I doubt the fact; cancer having a very wide and indeterminate signification with this writer. The disease can scarcely be mistaken for aneurism of any of the thyroidal arteries, if any share of attention be directed to the subject. Bronchocele has been considered in the light of a strumous disease — as a form of scrofula. Dr. POSTIGLIONE, however, contends that no connection exists between these diseases. As respects the state of morbid action in the gland, the concomitant phenomena, and the respective terminations of both diseases, there is certainly no intimate relation between them.

8. III. TREATMENT. — Previous to the use of iodine in the cure of bronchocele, numerous remedial means were recommended by writers. Of these, the most common were frictions with various liniments; dry rubbing; stimulating and astringent lotions; cold bathing, and cold douches; mercurial applications; plasters with cicuta and ammoniacum, or with ammoniacum and hydrarg.; repeated blistering; leeches applied to the tumour; electricity and galvanism; moxas, issues, and setons; ligature of the arteries supplying the gland; and extirpation of the gland itself. Amongst the internal remedies recommended, I may notice the various preparations of mercury; digitalis combined with camphor (OSSIANDER); sulphuret of potash; muriate of barytes (POSTIGLIONE); cicuta or belladonna, either alone, or with the muriate of baryta; the muriate of lime; preparations of potash and soda; various mineral springs; the use of sea water, and of distilled water; the ammoniated muriate of iron; burnt sponge, given either alone, or with mercury; and the ashes of the *fucus vesiculosus* (RUSSELL).

9. Of all these, the most celebrated was burnt sponge; and, after the discovery of *iodine*, this substance, which, having been found by Dr. STRAUB, of Berne, to be contained in officinal sponge, was recommended by him in 1829, and adopted by Dr. COINDET, of Geneva: and so successful has this medicine proved in the treatment of bronchocele, that, of a hundred and twenty cases treated with it by Dr. MANSON, of Nottingham, seventy-nine were cured, eleven greatly relieved, and two only were not benefited by it. Of several cases of the disease which have come before me since the introduction of this remedy into practice, there has not been one which has not either been cured or remarkably improved by it. I believe, however, that although it has been found the most certainly beneficial of any medicine ever employed in bronchocele, some other practitioners have not derived an equally uniform advantage from its use. I can account for this only by considering that it has been given in too large and irritating doses, or in an improper form; and without due attention having been paid to certain morbid and constitutional relations of the disease during the treatment. The cases of two females who were lately completely cured by the remedy confirm this inference. They had both had the tumour for several years, one for nine years; and had, on former occasions, gone through long courses of iodine, prescribed by judicious and eminent practitioners, but without advantage. When this medicine was ordered by me, it was, therefore, with great difficulty that they were induced to have recourse to it again. It was ordered in very small doses, often repeated, and strict attention was paid to the state of the secretions, and to the uterine functions. In the course of a fortnight an improvement was manifest; and of a few weeks longer, a great decrease of the tumours had taken place. One of these females, a married woman, who had been once pregnant nine years before, upon the disappearance of the tumour came with child; soon after which it somewhat suddenly reappeared, but the resumption of the iodine again dispersed it. The preparations given

in the Appendix (F. 204. 277, 278. 302. 323, 324.) are those which an extensive experience of its effects in various diseases, as well as in this, has led me to adopt.

10. In respect of the *use of iodine* in bronchocele, the weaker preparations should be at first preferred; and care should be taken never to exhibit them to the extent of irritating the stomach or bowels: when this effect is produced, little or no benefit will be derived from them. The success which Dr. Manson and M. Lugol have derived from this valuable medicine, I know from experience to be chiefly owing to the small and soluble doses in which they exhibited it. In some of the more obstinate cases, it will be often requisite to assist the operation of iodine by other means. Sometimes the occasional use of emmenagogue aperients will be of much service; and when the uterine functions evince disorder, as they very frequently do in cases occurring in females, I have usually directed either the sub-borate of soda, or milk of sulphur, to be taken, in the form of electuary, every night (F. 89. 281.). A calomel purge will also be sometimes of service. I have generally preferred the internal to the external use of the medicine in this disease. In some more obstinate cases, they may be both employed; but its external application should be of the mildest kind. In some cases, a moderate blood-letting may be premised; and some writers recommend that leeches should be applied to the tumour itself. Nearly all the cases which I have seen, having occurred in females, in whom it appeared requisite either to promote the menstrual discharge or to subdue uterine irritation, I have usually directed the bleeding, when practised, to be performed in the feet, or leeches to be applied to the groins. Dr. Coster has adduced a case in which galvanism materially assisted the iodine in removing bronchocele.

11. Dr. Kolley has stated, that iodine should not be exhibited where there is a disposition to congestion in the head and internal viscera; when febrile and inflammatory symptoms are present; when gastric, hepatic, or intestinal disorder exists; and when there is a disposition either to hydrocephalus or to pulmonary consumption. This is in some respects just; but after depletions, and when the more marked symptoms of these disorders are subdued, iodine may, notwithstanding, be exhibited, if its effects be carefully watched, and if the mildest and weakest preparations be selected, and these be combined with anodynes and narcotics. I have observed that a continued course of iodine has sometimes had the effect, particularly during cold weather, of producing pains in the limbs or joints resembling rheumatism, which have continued to increase if the medicine was not for a time relinquished. This effect has never appeared during a course of less than six weeks. It has generally soon disappeared after an aperient operation from sulphur, and one or two warm baths. A change to warm weather has also removed it.

12. If iodine fail of reducing the tumour, and if its pressure occasion urgent symptoms, recourse must be had to *surgical aid*. For a full exposition of this part of the treatment, I must refer the reader to Mr. Cooper's *Surgical Dictionary*, and limit myself to a brief enumeration of this class of measures. The first and most important of these is the insertion of setons in the tumour. This practice was recommended by Dr. Quadri, of Naples; and practised first in this country by Mr. Copland Hutchison, and with success. According, however, to the experience of Mr. James, Mr. Cooper, and Mr. Gunning, this practice is liable to occasion dangerous hæmorrhage, sloughing of the tumour, and irritation and inflammation of the trachea or larynx. Mr. Lyford has, however, employed setons successfully; whilst Hedenus states, that he has seen tetanus occasioned by their introduction. It has been recommended to cut off the supply of blood to the gland by tying its arteries; and the advice has been followed by Blizard, Walther, Coates, Brodie, and Earle. The cases thus treated by Blizard, Coates, and Brodie, terminated unfavourably; whilst those by Walther and Earle succeeded. Lastly, the tumour has been altogether removed by excision. Dessault first performed this operation successfully; Gooch attempted it in two cases, but failed; Dupuytren and Klein also failed; whilst Vogel, Theden, and Graeffe, performed it with success; and Hedenus, of Dresden, succeeded in six cases in which he resorted to this operation.

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BULIMIA. (See Appetite.)

BULLÆ. — Blains. Syn. Φλύκταιναι, Gr. *Phlyctenæ*, *Ampullæ*, Auct. Lat. *Bullæ*, Plenck. *Ecphlysis*, Good. *Dartre Phlyctenoide*, Alibert. *Bulles*, *Ampoules*, Fr. *Blasen*, *Wasserblattern*, Ger. *Blebs*, Eng.

Classif. 6. *Class*, 3. *Order* (Good). 4. *Order* (Willan). IV. Class, IV. Order (*Author*).

1. Defin. *An eruption of large vesicles containing a serous or sero-puriform fluid; frequently succeeded by yellowish or yellowish brown scabs, and sometimes by ulcerations.*

2. Plenck first separated the individual eruptions belonging to this order from the vesicular

eruptions, to which they are intimately related, and formed them into a distinct class. Willan afterwards adopted a nearly similar arrangement, comprising under this head erysipelas, but leaving out rupia. M. Biett has, however, with stricter propriety, excluded from it the former disease, and introduced the latter. Adopting, therefore, his classification, this order of eruptions embrace *pemphigus*, *pompholyx*, and *rupia*. These forms of bullæ proceed from internal causes; but various irritants, applied externally, will also give rise to a similar eruption. The influence of cantharides and other rubefacients, of excessive heat or cold, of friction, of poisons, &c., in occasioning vesications, is well known. In a pathological point of view, both the *bullæ* produced by internal causes, and the *vesications* formed by external causes, depend upon very nearly the same state of the *rete mucosum*. This tissue is more or less inflamed, or affected in such a way as to secrete a greater quantity of serous fluid than can be exhaled through the cuticle, which is thereby separated from the vascular tissue, and, by the increase of this fluid, elevated into blisters, or bullæ, of various dimensions.

3. The eruptions of this class are both acute and chronic. The parts affected are often preceded by more or less redness, and occasionally by a very slight elevation. But, in many instances, no such inflammatory appearances are observed before the serous effusion beneath the cuticle takes place. After an indefinite period, varying from a few hours to four and twenty, a small vesicle appears, and gradually enlarges, until it reaches, generally within eight and forty hours, a great size. The bullæ thus formed are at first tense, and the fluid contained in them serous and transparent; but it sometimes becomes, especially at a later stage, sero-purulent, and rarely sero-sanguineous. After an uncertain time the bullæ pass from a tense to a flaccid state, the included fluid, at the same time, assuming a very slightly opaque and thickened condition. If they be situated where the epidermis is very thin, or occur in very young infants, they often break before this change in the fluid takes place. But where they are more persistent, the humour becomes thicker, and often forms scabs of a light yellowish colour. The affected parts of the skin are afterwards either provided with a new cuticle, or are affected with more or less severe ulceration. Bullæ may thus appear in any part of the surface, and even in the scalp, and be more or less numerous, or thickly scattered over the body. I have observed them so extensive, as respects both number and size, as to occasion death, obviously from the constitutional disturbance and irritation resulting from the loss of the cuticle over more than two thirds of the whole surface of the body.

4. These eruptions are also either idiopathic or symptomatic — most frequently the latter. They may also be infectious, or dependent upon the air of an hospital. Thus I have seen them prevail (chiefly in the form of pemphigus) at one time, in Queen Charlotte's Lying-in Hospital, to the extent of affecting nearly all the infants born there during several months, notwithstanding fumigation and whitewashing were resorted to; no other disease having occurred there during that period. In a chronic state, they are usually symptomatic of irritation or other disorder of the digestive organs, more especially of the alimentary canal; of chronic bronchitis, and of general cachexy. They are sometimes observed as an attendant upon small pox, and very rarely in the other exanthemata.

Bibliog. and Refer. — *Bateman*, Synopsis of Cut. Diseases, &c. 7th ed. p. 193.; and Med. and Phys. Journ. vol. xi. p. 230. — *Tilesius*, in *Martens*'s Parodoxien, &c. Leips. 1802, b. ii. heft. i. p. 18. — *Rayer*, Traité des Maladies de la Peau, &c. t. i. p. 142. *Cazenave* et *Schedel*, Abrégé Pratique de Maladies de la Peau, &c. Paris, 1828, p. 125.

CACHEXY. Syn. *Cachexia* (from *κακος*, ill or bad, and *ἕξις*, a habit). A *bad Habit of Body*.

Classif. Constitutes the 3d *Class* in Dr. *Cullen's* Nosology; and the 4th *Order* in the *Class*, Diseases of the Sanguineous Function, in Dr. *Good's* Arrangement. I. Class, V. Order (*Author*, see *Preface*).

1. Defin. *Depravity of the constitution, without fever, affecting more or less the solids, the circulating fluids, and the secretions.*

2. The chief characteristics of this state are, want of vigour and vital cohesion of the soft solids, with defective digestion and assimilation, diminished animal warmth, universal languor, and deficient strength or activity. The skin is usually pale, yellowish, or lurid; and the white of the eyes in some cases almost transparent. As this state advances, the countenance becomes pale, white, or bloated; the skin loses its vital tint, and changes either to a dirty white, or to a yellow hue. The muscles are flaccid, and deprived of their healthy elasticity; the mind is inactive; the breathing difficult upon exertion; the feet and ankles swollen; the pulse slow and soft; the eyelids œdematous; the urine turbid; the alvine evacuations irregular and offensive; the sleep oppressed, and all the vital manifestations are enfeebled and languid. In females, more or less of these symptoms are associated with suppressed, retained, morbid, or irregular menstruation; pains in the forehead, back, loins, or limbs; palpitations; and longings for noxious or unwholesome articles of food, or for what is not food. (See Appetite — *Morbid*, and Chlorosis.)

3. This state of disease appears to be chiefly the result of diminished vital energy, produced by various mental and physical causes; in consequence of which state the food is not sufficiently elaborated and assimilated, the circulating fluid does not experience the requisite degree of change resulting from nervous influence, and the action of the viscera, and the secreting functions are imperfectly executed, whereby the whole mass of blood is impoverished or depraved, the manifestation of the nervous and muscular systems are feebly performed, and, ultimately, the whole of the structures more or less vitiated. (See Blood — *Alterations of, in Disease*.) Cachectic maladies are very frequently associated with, or preceded by, obstruction, or other disease of some important viscus. If the pulse does not exceed 80 or 84, particularly towards evening, we may conclude that the lungs are sound; and if the pulse be regular, and the sleep undisturbed, we may infer that the heart and its capsule are not, at least, seriously affected. The viscera most frequently diseased are the liver, mesenteric and lymphatic glands, the spleen, pancreas, kindeys, uterine organs, stomach and bowels; and the affection of these is sometimes a cause of, at other times an

attendant on, or even consecutive of, the cachectic state; the vital endowment of the frame being the first to experience the morbid change. It would appear that the earliest manifestation of this change takes place in the ganglial system; the internal viscera and circulatory organs, whose functions are actuated by this system, becoming next disordered, generally in such a manner as to attract the attention of the observer to the nature and source of disturbance.

4. The TREATMENT of cachexies chiefly consists of light nutritious food, taken in such quantity as the digestive organs can easily dispose of; healthy air, or change of air, with gentle and regular exercise, short of fatigue; of tonics combined with deobstruents and gentle aperients, in order permanently to excite the languid powers of life, and to promote the functions of the secreting organs; and of the use of chalybeate and deobstruent mineral waters, with frictions with stimulating liniments, and pleasant mental occupation. The sulphate of quinine, or the preparations of cinchona, particularly its compound tincture, with small doses of the oxymuriate of quicksilver; the various vegetable tonics, bitters and aromatics, with the mineral acids, especially the chloric acid; the preparations of iron; the chlorates of potash, soda, and lime; sarsaparilla, with guaiacum, &c.; the balsamic and terebinthinate substances; camphor, and the essential oils, and the preparations of iodine; are most serviceable in cachectic diseases, either exhibited singly, or combined with laxatives or purgatives so as to promote the secreting and excreting functions. As the various disorders of this description are often connected with obstructed function, or infarction, of some important viscus, it will frequently be requisite to exhibit at the same time, or in conjunction with some of the above remedies, small doses of blue pill, or of the hydrargyrum cum creta; or to combine them with rhubarb, aloes, or other purgatives, and often to add to them aromatics or warm gum resins. The object in these cases is to promote a regular action of the viscera, by increasing their vital energy; and this is better attained by adopting measures calculated to benefit the general health, and to increase the action of the stomach and bowels, than by the occasional use of active and debilitating cathartics; which, however, operate more efficiently and much more beneficially in those cases, when combined with bitters and tonics, — a fact long since insisted on by HOFFMANN, and others. (See also MERCURIAL CACHEXY, SCROFULA, and SYPHILITIC CACHEXY.)

BIBLIOG. AND REFER. — *Bonetus*, Sepulchretum, l. iii. s. xx. obs. 1—14. — *Wedel*, De Cachexia. Jen. 1715. — *Stahl*, Diss. de Cachexia. Halæ, 1710. — *Hoffmann*, De Cachexia, Opera, t. iii. p. 318. — *Nicolai*, Diss. Sistens Genuinam Cachexiæ indolem. Jenæ, 1760. — *Vogel*, Diss. Sistens Cognitionem Morborum. Goet. 1763. — *Wedekind*, Ueber die Kachexie im Allgemeinen, &c. 8vo. Leips. 1796.

CACHEXY, AFRICAN. SYN. *Cachexia Africana, Negro Cachexy*, Dirt-eating. *Mal d'Estomac*, Fr.

CLASSIF. I. CLASS, V. ORDER (*Author*, see *Preface*.

1. DEFIN. *General cachexy, with vitiated functions of the stomach and bowels, and a propensity to eat chalk, clay, or other dirty and unwholesome substances, generally affecting the aborigines of intertropical countries, &c.*

2. This disease is a complication of cachexy with anæmia and pica, or depraved appetite (see APPETITE — *Depraved*), at least in its advanced stages. It is very common amongst the natives of Africa, and the slaves in the West Indian colonies; and is attended with loss of appetite, continued pain of stomach, whiteness of tongue, difficulty of breathing upon the slightest exertion, drowsiness, inactivity, and general debility, despondency, with fondness of solitude, paleness of the face, lips, and palms of the hands, coldness, and often œdema of the extremities, glassy state of the *tunica adnata*, weakness and smallness of pulse, scanty, pale, or milky urine, whitish or clay-coloured stools, with other signs of depressed vital power and deficient assimilation. Owing to the depressed energies of the frame, and particularly of the digestive organs, a vitiated state of the juices of the stomach, with morbid acidity of the *primæ viæ*, evidently prevails; occasioning sensations which probably excite the patient to have recourse to chalk, clay, or other absorbent matters to relieve them, and which occasion whatever vitiation of appetite may be additionally observed. This morbid condition appears, however, not to be limited to the stomach, but to be extended along the alimentary canal: the mucous surface of the bowels are in a state of morbid irritation, giving rise to offensive evacuations; the lacteal and mesenteric glands become irritated and obstructed, owing to the passage through them of unhealthy chyle and morbid secretions, and subsequently incapable of conveying sufficient nourishment into the circulation; the blood is thus rendered poor, pale, and in all respects such as is described in the article on the BLOOD (§ 34. *et seq.*): and the liver, pancreas, spleen, lungs, and heart, become pale, atrophied, and sometimes softened, from being deprived of the requisite nourishment, and supply of the circulating fluid. And at last the patient sinks, from depression of the vital power and anæmia, presenting the following appearances on examination:—

3. The *stomach* is often flabby, softened, apparently distended, and pale. The liver is sometimes enlarged; occasionally atrophied, hardened, and generally very pale. The bile is usually watery, pale, or straw-coloured: the gall-bladder has contained biliary concretions in a few cases. The mesenteric glands are always enlarged and hardened. The mucous follicles of the intestines are often morbidly developed. The heart is soft and flabby; the blood in its cavities and large veins is watery and thin; and sometimes fibrinous concretions are found in these situations. Serous effusions, to a greater or less extent, are also frequently found in the thoracic and abdominal cavities.

4. CAUSES.—This affection is very nearly allied to chlorosis: but whilst the latter affects females, and most commonly about the period of puberty, the former occurs in both sexes, and sometimes at as early an age as six or seven years. It is generally attributable to depressing or debilitating causes — mental or physical. The despondency and grief occasioned by separation from the place of nativity and friends, and by a state of bondage, often *dispose* to it; and thus it is not infrequently accompanied with nostalgia. The lax and weak habit of body, and the indolent disposition of the negro, seem also to favour the appearance of the

disease, particularly in those who have been badly nursed and neglected in early life. The chief *exciting* causes are, poor diet, hard labour, harsh treatment, exposure to cold and moisture, insufficient clothing, and venereal excesses early indulged in. The causes of the disease, the symptoms it presents in its progress, and the appearances observed after death, are altogether irrefragable evidence that it proceeds from great depression of the vital energies, especially of the digestive organs; occasioning, in its more advanced states, anæmia, imperfect nutrition, and vitiation of the fluids and soft solids of the frame.

5. The Treatment is in no respects different from what has been recommended in general terms in respect of Cachexia and *Depraved* Appetite (see these articles). Warm clothing, and a digestible nourishing diet, are indispensable to recovery: and to these should be added, regular but moderate exercise; bathing, followed by frictions of the surface; tonic, aromatic, and saline medicines; the use of the carbonates of the alkalies, combined with tonics and hot spices. Warm stimulating laxatives, such as the compound tinctures of rhubarb or aloes, or the bitter aperient tincture (F. 699.); the elixirs prescribed in the Appendix (F. 103—106.); the preparations of iron, cinchona, and myrrh; are severally of the greatest benefit, especially in conjunction with warmth, a residence in a warm dry situation, and sufficient nourishment. Care also ought to be taken to preclude any access to the substances for which the morbid propensity is entertained.

Bibliog. and Refer. — *Davidson*, New York Med. Repos. 1799, vol. ii. No. iii. art. 6.—*Chisholme*, in Ibid., and Med. and Phys. Journ. 1800, p. 614. — *Hunter*, On the Diseases of the Army in Jamaica; and in Edinburgh Medical Commentaries, vol. xiii. p. 194.

CÆCUM. — Its Diseases. 1. This viscus is not infrequently the seat of dangerous and fatal diseases, without any other part of the digestive tube being affected; and it is evidently concerned in the production of other disorders, in which it has usually been considered as merely accidentally to participate. If we consider its anatomical relations and functions in man and the lower animals, we shall be justified in viewing it as a distinct organ, performing offices modified in their nature from those of the rest of the alimentary tube. Notwithstanding this individuality, both its functions and its diseases have not generally attracted that degree of attention, nor received the investigation, they evidently deserve; and, hitherto, the latter have not even obtained a place in practical or systematic works. Some years ago, I took occasion to notice the importance of the offices and pathological states of this viscus, and detailed some cases in which it was remarkably diseased. Several facts illustrating the practical part of this subject have been recently accumulated, and some have since been observed by myself. From these sources, I shall arrange all that is known respecting the *diseases* of this organ, after having premised a few remarks on its functions.

2. The resemblance of the cæcum to the stomach in most of the graminivorous, and particularly the ruminating, animals, as well as its form and situation throughout all the higher classes of the animal kingdom, are circumstances showing that it is an important viscus, and one in which the last act of digestion is performed. M. Viridet appears to have been the first who entertained correct ideas of the actions of this viscus. " Sed de intestino cæco," he states, " quidquam dicere præstat, cum in quibusdam animalibus sit summè necessarium, nempè quibus et amplissimum, forsanque vicem alterius ventriculi gerit; nam glandulis crassioribus donatur, quorum succus solutione heliotropii rubescit, et solutione sublimati albescit, suisque salibus acidis et volatilibus præditum est." (*De Prima Coctione*, p. 270.) This view has been recently confirmed by the able researches of Tiedemann and Gmelin, professors at Heidelberg. The situation of this organ, its capacity, its attachment to the parietes of the abdomen, and the circumstance of its contents being propelled in opposition to their gravity, are proofs of their longer retention than those of any other part of the digestive tube; and confirm the view that has been taken as to its being, in some respects, a reservoir, wherein is poured that portion of the materials remaining in the ileum, in order to undergo the latter stages of digestion, and the first of fæcation. Besides other proofs of these functions, it may be stated, that it is very abundantly supplied with large follicular glands, which, according to the experiments of Tiedemann and Gmelin, secrete an acid, albuminous, and solvent fluid, which mixes with, and promotes the digestion of, those portions of aliments which have withstood the actions of the stomach and small intestines, or been insufficiently changed by them. In order that this office may be the more completely performed, the anatomical relations of the cæcum admit of the remora, for a longer or shorter time, of the matters which pass into it; so that a last effort is here made to obtain the remaining nourishment from the ingesta: and thus it performs, if not the very last act of digestion, at least the last important part of it. But it also seems to fill an additional office, namely, that of secreting, chiefly from its numerous follicles, an unctuous or oily fluid for the protection of the surface of the large bowels from the irritating effect of the fæcal matters passing along them; and it is probable that the constituents both of this fluid, and of the other secretions poured out from its surface, consist of elements that require to be eliminated from the blood; so that, in addition to its other functions, it is also a depurating organ.

3. The usual contents of the cæcum are of the consistence of a soft *bouillie*, or gruel, of a brownish yellow colour, and here first acquire their fæculent odour; which, according to Tiedemann and Gmelin, proceeds from the volatile oily substance secreted by its follicles. During the changes that are effected by the cæcum on its contents, an acid and hydrosulphuretted hydrogen gas is disengaged. This gas seems to be generated only in small quantities during the healthy functions of the organ; but when its vital energies are diminished, and when, consequently, a greater remora than usual of its contents takes place, air is disengaged in much greater quantities, and sometimes to the extent of injuring its healthy tone. Whilst the cæcum reacts energetically on the distending power, this flatus, along with a portion of its contents, are thereby propelled along the colon: but on many occasions, and under particular circumstances, considerable opposition about

the right flexure of this bowel is offered to their transit; and hence, pain and uneasiness in this part of the colon, as well as in the cæcum, are complained of; giving rise to the idea of the existence of either hepatic or nephritic disease.

4. Under other circumstances of protracted disorder of the digestive organs, as when acidity is generated in the stomach and small intestines, and the food imperfectly digested; or when the ingesta are of a stimulating, irritating, or otherwise unwholesome kind; or when the secretions of the liver, pancreas, and mucous surface of the small intestines, are of a morbid or excoriating nature, — then the accumulation and remora of these matters in the cæcum are productive of disorder of its functions, of inflammation, and even of change of its structure.

I. DISORDERED FUNCTIONS OF THE CÆCUM. CLASSIF. I. CLASS, I. ORDER (*Author*).

5. When the vital energies are weakened, and the alimentary canal debilitated, the cæcum often betrays greater disorder than any other part of the digestive system. Its situation and functions will, from what has already been stated, account for the frequency and importance of its diseases. In some cases, the irritation produced by morbid or accumulated matters in it is slight, and readily productive of sufficient reaction of its muscular coats to propel them along the colon. In other instances, the efforts made to accomplish this end, owing to the obstructions occasioned by the lodgment of flatus about the right flexure of the colon, or by irregular spasmodic contractions of this bowel, are ineffectual, and give rise to colicky pains. If the interruption is removed, disorder soon subsides; but if it continue for any considerable time, the more violent forms of colic or ileus supervene. When the internal surface of the cæcum is in an irritable state, disorders of this description are readily produced by the accumulation, even to a small extent, of the intestinal matters poured into it from the ileum, especially when they are of a more than usually stimulating kind, or if the secretions be morbid. In young, irritable, or nervous persons, and in those who partake of much acid or unripe fruit, or who neglect their bowels, particularly females who wear very close cinctures around the upper part of the abdomen, diseases affecting the alimentary canal, and, sympathetically, some other parts of the frame, not infrequently thus originate in this viscus. Accumulations, however, of alimentary and fæcal matters sometimes take place in it to a great extent, without producing much disorder, until the distension and irritation thereby occasioned give rise to disease of its internal surface, of its follicles, or its parietes generally. Persons advanced in life, of a phlegmatic temperament, or lax and torpid habit of body; those who take little exercise, or whose occupations are sedentary; and especially aged females; are very liable to be thus affected. During this state of infarction, the retained matters are more or less changed, partially decomposed, become acrid, excoriating, and a source of irritation both to the mucous surface itself, and to its follicles; which are thereby obstructed, and ultimately inflamed and ulcerated. In this way, most of the morbid states about to be described originate.

6. Several instances have been recorded by the older writers, where the stones of fruits, biliary and intestinal concretions, and hardened fæcal matters lodged in the cæcum, have occasioned severe colic, and even fatal ileus. Some cases of this kind are referred to in Dr. MONRO's instructive work on Morbid Anatomy, as having occurred in his and his father's practice. In one of these, a concretion upwards of seven inches in circumference filled up this viscus. FONTANUS found an earthy concretion in it, as the only morbid appearance after death from ileus; and HELM, nearly three hundred cherry stones in the same situation, and in the ileum before it opens into the cæcum, in a fatal case of this disease. In some instances, accumulations of fæcal matters with great distension occur, without much suffering referrible immediately to the cæcum being experienced; the organs affected secondarily evincing the most marked disorder. This was shown by the case detailed by M. ODIER, of Geneva, of the celebrated M. DE SAUSSURE, in whom this viscus was very greatly dilated. When very much distended, it is generally diseased in other respects; its coats are more or less thickened, inflamed, and ulcerated, or its follicles enlarged. MONRO, NACQUART, and others, have adduced instances in which its engorgement and enlargement were accompanied with chronic inflammation and thickening. Mr. WILMOT relates a case in which it was dilated to the extent of containing a gallon, filled with fæcal matters, and perforated by a circular ulceration. When the distension by accumulated matter is great, it may, from rising high in the abdomen, and pressing upon the nerves, vessels, and ducts in its vicinity, occasion numbness, and œdema of the right lower extremity, retraction of the testicle, and derangement of the urinary secretion; and thus be mistaken for disease of the kidney. M. DUCOS has detailed an instructive case of this kind; and two similar instances have been observed by me. In general, the seat of the tumour arising from collections of morbid matters in the cæcum, and the disorders connected with it, readily lead to the recognition of its nature, as in the case recorded by Dr. BARLOW. When, however, there is little or no tumour formed, and the symptoms are of a chronic and less violent kind, the cause of disorder may long exist in this situation, and escape detection. In a case of a young lady whom I attended with Mr. ANNESLEY, this part was considered as the seat of disorder, from its fulness and hardness upon an examination made when the patient was semi-recumbent, and the thigh slightly bent, and a treatment in accordance with this view strenuously insisted upon. She had been attended by several eminent physicians during the preceding three or four years, and very different opinions entertained of the nature of her ailments. After persistence in the treatment about to be recommended, an evacuation of hardened balls, containing indigestible substances which she had chewed many months previously, were evacuated, the fulness and hardness in the right iliac region disappeared, and the patient perfectly recovered. Two nearly similar cases to this were detailed by me in a work referred to below.

7. Substances incapable of digestion, either taken accidentally or from a depraved appetite, also frequently lodge in the cæcum, and remain in it for a very long period, sometime without

producing much disorder, at other times occasioning the most violent effects. In other cases, in addition to various morbid matters, large balls of worms, both lumbrici and ascarides, collect in this viscus, and occasion much local irritation, or even inflammation of its inner surface, and constitutional disturbance. Mr. BLACKADDER has detailed some interesting instances of this occurrence. He found, in a patient who had complained of disorder of various organs, and of a gnawing soreness in the right iliac region, ragged ulceration of the inner surface of the cæcum, which contained an immense number of worms. The rest of the alimentary canal was sound.

8. When the cæcum is much enlarged, or otherwise diseased, it may also be *displaced.* Cases are recorded by SALZMANN and ANNESLEY, in which its attachment to the internal iliac muscle had yielded so far that it had passed over to the left side; and others, in which it had descended very low into the middle of the pelvis, and pressed upon the urinary bladder.

9. Not only may indigestible substances and morbid concretions sometimes lodge in the cæcum, producing much local irritation and general disturbance, but they may, when small, sometimes pass into the vermiform appendage, where they occasion, as will be shown in the sequel, the most dangerous effects. It does not, however, appear that the simple presence of any of these substances in this process is always followed by such results. Mr. BLACKADDER relates a case in which he found a small concretion in this part, and yet the patient had not complained of any symptom referrible to the right iliac region. I have treated, or been consulted respecting, four cases, in which foreign bodies and concretions were found in the appendix after death; and in all, the symptoms were those of the most violent peritonitis complicated with ileus, and terminating in sphacelation of this process itself. Two of these I attended with Mr. PAINTER, of Crawford-street, by whom the inspections were made; and who ascertained that the substance found in the appendix, in one case, consisted chiefly of cholesterine.

10. The *phenomena* usually occasioned by fæcal matters collected in the cæcum, and by distension, enlargement, or irritation of this viscus, will necessarily vary with the nature of the offending substances, the extent to which they may have accumulated, and the age, temperament, and habit of body of the patient. The disorders which result are, 1st, Local; 2d, Symptomatic, and 3d, Constitutional. *a.* The *local signs* are more or less fulness, hardness, or distension in the right iliac region: sometimes, on examination carefully with the points of the fingers, the abdominal muscles being relaxed, a doughy hardness is felt. In other cases little or no pain, even upon a minute examination, is complained of; but occasionally, especially if the disorder be about inducing inflammation, both tenderness and pain either exist more or less constantly, or come on in paroxysms; and the patient generally reposes on the right side. When the bowels are constipated, and interruption of the passage of matters through the cæcum occurs, the paroxysms of pain are very acute, and sometimes attended by vomtiing, and all the symptoms of the most severe colic, or even those of ileus. In such cases, upon examination, signs of obstruction either in the cæcum or in its vicinity are detected, unless general peritonitis may have come on; and then the origin of disease is very generally referred to the cæcal region, or the tenderness and pain are most acute in that situation.

11. *b.* The *symptomatic disorders,* when this viscus is much distended, either by fæcal or other matters, or by flatus, or by both, as is most commonly the case, are, numbness of the right thigh, œdema of the right foot and ankle; sometimes retraction of the testicle, or frequent calls to empty the bladder, and sometimes hæmorrhoids; uneasiness or pain in the right iliac region, often extending to the hypochondrium; various dyspeptic symptoms, costive or irregular state of the bowels; occasionally diarrhœa, with scanty, offensive, and mucous stools; and, if irritation be excited in the mucous surface and follicles of the organ, the efforts made to evacuate the bowels are attended by severe tormina, and even by retching. I have seen several cases of varicose veins of the leg, or indolent ulcers, and a case of disease of the bones of the foot, the occurrence of which was evidently connected with great distension and accumulations in the cæcum; the symptoms of this disorder, with more or less tumefaction and hardness in the iliac region, having been found on examination. The justness of this view was fully shown by the success of the treatment, which was based upon it.

12. *c.* As long as the states of disorder have not advanced to inflammation or ulceration, the effects are often not very manifest upon the *constitution.* The countenance and skin, however, are pale and lax; the complexion is deficient of clearness, and, with the surface generally, often covered with an oily or dirty moisture; the perspiration is fœtid, and the breath offensive; the soft solids lose their elasticity, and are slightly emaciated; the lips are usually pale, the tongue white or loaded at its centre and base, sometimes red at its point and edges; the pulse is weak, soft, or small, frequently slow, but easily accelerated; and, at an advanced stage, the symptoms more clearly manifest that the blood is imperfectly depurated, or that it is affected by the absorption of a portion of the excrementitious matters retained in the cæcum. In addition to these symptoms, general debility, and disinclination to any physical or mental exertion, are often complained of. The above states of disorder continue for a longer or shorter period; when at last the local irritation either produces increased action of the muscular coat of the cæcum, and ultimately the dislodgment of the offending matters, or gives rise to acute or chronic states of inflammation, and various consecutive organic changes. In some instances, the accumulation in this viscus, and the spasm of the adjoining parts, amount to complete obstruction of the passage through the alimentary canal, even without inflammation or any disorganisation of the cæcum itself having taken place; causing violent colic and ileus, as in the cases already noticed (§ 10.); the most marked symptoms during life being referrible to the superior portions of the tube, and the lesions after death being most remarkable in those parts, particularly about the

termination of the ileum, and the ileo-cæcal valve.

13. *Treatment.* — The intentions in this state of disorder are very obvious; namely, 1st, to evacuate morbid collections; and, 2d, to prevent their re-accumulation, by preserving a regular tonic action of the viscus, and by strengthening the digestive organs generally. *a.* The evacuation of the accumulated or retained matters is to be attempted by means appropriate to the circumstances of the cases. If there exist irritability of stomach, or even any tendency to it, or to febrile action; or if there be any pain or soreness in the iliac region; full doses of calomel should be first exhibited, the enemata about to be suggested administered, and the liniments prescribed in the Appendix (F.296. 311.) assiduously rubbed over the cæcal region, with the view of exciting the healthy action of the viscus. If, on the other hand, the stomach and bowels be torpid, and the former can retain purgative or cathartic medicines, they may be given, selecting those which are the least irritating in their effects. I have seen inattention to this caution, the most stimulating cathartics having been exhibited, productive of the worst consequences; a state of disorder simply functional, or colic from distension and obstruction of the cæcum, being converted into either inflammation of the bowels or dangerous ileus. When, therefore, an irritable state of the stomach supervenes in our attempts to remove obstructions of this viscus, we should desist from the exhibition of purgatives, or even of aperients by the mouth, excepting full doses of calomel, or calomel combined with hyoscyamus or opium, and moderate doses of nitrate of potash, or sub-carbonate of soda, or of both, which will generally be retained, and will allay the sickness and retchings. But we ought strenuously to persist in the administration of enemata — preferring those which are oleaginous, saponaceous, and solvent — and in the use of the liniments. The enemata should be always large, and injected by means of the valve-syringe now in use, so that they may reach the seat of obstruction. In obstinate cases, this object will be facilitated by placing the patient upon his knees and elbows during their administration, and elevating the pelvis as much as possible above the rest of the trunk. The practitioner should not be discouraged by the ineffectual administration of several injections, but repeat them according to circumstances, employing at the same time frictions over the abdomen with the liniments already advised. If flatulent distension of the abdomen be present, they will assist in removing it; but in such cases the terebinthinate enemata ought to be preferred. When we suspect the presence of worms, in addition to other morbid matters, aloes and the alkaline solutions, assafœtida, camphor, lime-water, &c. may be used in the injections. In the slighter and more usual cases, the aperients in common use, particularly castor oil, the compound decoction of aloes, the combination of the compound infusions of senna and of gentian, or the infusion of senna with decoction of cinchona, or the several formulæ of this description contained in the Appendix (F.215. 266. 562. 575.), may be prescribed, as they may appear appropriate to the circumstances of the case.

14. *b.* Having apparently removed whatever obstruction may have existed, — the cæcal region being soft and natural, and the actions of the bowels free, — the object is next to prevent the recurrence of disorder, and to strengthen the digestive organs, by vegetable tonics and bitters combined with aperients; by sulphate of quinine with aloes; by small doses of blue pill with the alkaline carbonates and other deobstruents, and given occasionally with the view of promoting and correcting the secretions; by the occasional use of the liniments above referred to, or by wearing a warm stimulating plaster (see F. 109. 115. 117.) over the right inferior regions of the abdomen. In every case, attention should be paid to the state of the digestive, assimilating, and secreting functions; regular evacuations of the bowels promoted, by the occasional use of enemata; and the diet strictly attended to.

II. Inflammation of the Cæcum. Classif. III. Class, I. Order (*Author*).

15. Although inflammations of this viscus have been generally overlooked or confounded with those affecting either the colon, the small intestines, or the peritoneum, there are few diseases more defined in their character, or more distinctly limited in the great proportion of the instances of their occurrence, than they are. In respect of its *seat*, inflammation may affect chiefly the mucous surface, or the follicles, or all the coats of the organ more or less: or it may attack the vermiform appendix only, or the cellular tissue connecting the cæcum to the internal iliac muscle. As to the *character* of the inflammatory action, it may be sthenic and acute; or acute, asthenic, and spreading, as in dysentery and fever: it may also be more or less chronic. Cases of all these states of disease are to be found scattered through the works of modern medical authors, and most of them have come before me. The first case which attracted my attention to the importance of attending to the state of this viscus in various abdominal diseases, occurred in 1816, in a hot climate. The patient had the usual symptoms of inflammatory dysentery, with violent pain, and subsequently tumefaction in the cæcal region. The disease had been neglected in its early stages; and it was only shortly before the sudden subsidence of this tumour that I observed it. Upon straining at stool, a sensation of something having burst internally was felt; and very soon afterwards above a pint of purulent matter, mixed with a little blood, was discharged. Upon examination six hours after death, the cæcum was found ulcerated, discoloured, and nearly sphacelated, with an opening through the part attached to the abdominal parietes leading to the nearly empty sac of an abscess which had formed in the cellular tissue connecting this viscus to the side; the mucous membrane of the colon was inflamed in parts, and excoriated.

16. i. The Causes of inflammations of the cæcum are chiefly the functional disorders already described. A morbid state of the abdominal secretions, and particularly an increased secretion of vitiated acrid bile; the irritation of foreign bodies, indigestible substances, and of worms; a strangulated hernia, or the pressure of an ill-constructed truss; the suppression of the hæmorrhoidal and menstrual discharges; and the presence of biliary or intestinal concretions, hardened fæces, or the stones of fruits, or their escape into the vermiform

appendage. Inflammatory irritation of the mucous membrane and follicles of the viscus is not infrequent after child-birth, and as an attendant upon some of the diseases which affect chiefly the bowels of females at this period. In connection with the accumulation and retention of morbid matters, it very often constitutes the earliest pathological state in dysentery and diarrhœa, and consequently then arises from the same causes that produce those diseases.

17. ii. SYMPTOMS. — *A. Of inflammation of the mucous surface of the cæcum.* These chiefly consist of an irregular, mucous, offensive, and sometimes slightly bloody appearance of the stools, with tenderness upon pressure or examination of the cæcal region. The evacuations are generally preceded by tormina or griping pain, extending from this part upwards to the right side, and down towards the pelvis. The tongue is slightly loaded or furred; and more or less symptomatic fever is present. This state of disorder is liable to lapse into a chronic form, and to continue for a long period; or it occurs primarily, from the functional disorders already described, and sometimes fluctuates as to the degree of severity. In the more slight or chronic states of inflammation of this surface, the patient often complains of little beyond irregularity of the bowels and colicky pains in the abdomen, with slight emaciation, and loss of the healthy complexion; till, at last, an acute attack of the disease supervenes, from the extension of the inflammatory action to the more exterior coats; or the chronic organic change has proceeded so far as to implicate adjoining parts, and to occasion a train of severe symptoms. In this manner, the more dangerous forms of dysentery not infrequently take place. During the earlier states of inflammation of the internal surface of the cæcum, ulceration may have commenced, or the follicles become diseased, and the coats successively perforated, until the peritoneal covering is attacked; when the inflammation assumes more serious features, owing both to its extension, and to the nature of the tissues which are now invaded by it. The perforation may, however, take place in that part of the parietes of the viscus where it is attached to the iliac muscle; and thus inflammation be extended to, and abscess form in, the cellular tissue exterior to it, and break either externally, or into the cæcum, or both; a sinuous communication being thus formed between the cavity of the organ and the surface of the body. In the manner now described, the more acute states of inflammation of the cæcum, and its connecting tissue, may arise; or these states may primarily affect the different structures composing its parietes, or may originate in its vermiform appendage.

18. *B. Acute inflammation of the coats of the cæcum* generally commences with violent pain in the right iliac region, frequently attended with a burning sensation, and most exquisite tenderness, particularly when the serous coat of the viscus is affected. It is accompanied with the most severe tormina, extending from the above region upwards to the right hypochondrium, across the abdomen, down into the pelvis, and along the thigh of that side. If the disease be attended by distension of, or fæcal collections in, the cæcum, the testicle is retracted, and the thigh either very painful or numb. While the pain occurs in paroxysms, and shoots in various directions throughout the abdominal cavity, it is constant and fixed in the situation of the cæcum. The regions of the abdomen, although sometimes distended and tense, bear examination, excepting in the cæcal region and its immediate vicinity, where the least pressure cannot be tolerated. The pain is usually increased when the body is erect; and the patient reclines on the right side, with the trunk slightly bent, and the thighs drawn upwards, so as to relax the parts in the vicinity of the disease. The bowels are generally torpid; but vomiting is not complained of, unless obstinate constipation exists, or drastic purgatives have been given early in the disease. The pulse is usually quicker than natural; but it is occasionally not much affected; and the temperature of the surface is increased. In some cases, the above constitute the chief symptoms; but in others much more disturbance ensues, particularly if the disease advances, or is neglected in its early stages, and the peritoneal surface of the cæcum is affected. When such is the case, the local symptoms increase in severity; the abdomen becomes more generally tense and painful, owing to the extension of the inflammation over the peritoneal covering of the viscus and the adjoining parts; and the symptoms of peritonitis, often attended by obstinate vomiting, supervene, with great frequency of pulse, and general fever. If the appendix participate in the disease, the symptoms are still more acute; general peritonitis is very quickly produced; adhesions are formed between it and the adjoining peritoneal surface; and the appendix soon sphacelates; a fatal result taking place, usually in a very short time. In other cases the disease assumes a somewhat less violent character, and terminates in suppuration, owing to the cellular tissue connecting the coats of the intestine to one another and to the abdominal parietes being chiefly affected. When this occurs, the issue is not so rapid as in the former instances, but is sometimes prolonged for a considerable period; and, in some cases, recovery is at last brought about. The foregoing history applies more strictly to inflammation originating in the cæcum; but when it commences in the appendix, or in the external connecting cellular tissue, the symptoms are often much modified.

19. *C. Inflammation of the appendix cæci* appears to be attended from its commencement with more acute symptoms than that of the cæcum itself. In four cases of this description which I have seen, this part was primarily and chiefly inflamed, owing to hard substances having escaped into it, and had occasioned general peritonitis, and gangrene of the appendix itself. In all of these, obstructions of the bowels, with obstinate retchings, was present at the time when I first saw them; and in the latter stages of the disease, vomiting was attended by violent tormina, and the discharge of matters evidently from the small intestines. Thus the symptoms of ileus were superadded to those of peritonitis. *Upon dissection,* the cæcum was found inflamed only in its peritoneal surface, in three of the cases; in the fourth, inflammation was observed also in its inner surface. In one, where the appendix contained a small biliary concretion, its extremity adhered to the surface of the cæcum after passing

around a convolution of the ileum, which it had evidently strangulated; but at the time of the inspection it was quite gangrenous on each side of the concretion. In another case, appearances of strangulation were manifested in a less satisfactory manner; the surrounding parts being so agglutinated by albuminous exudations, that their respective relations were not obvious. It does not appear, however, that inflammation originating in the appendix always arises from substances having escaped into it. M. Louyer Villermay has detailed two cases of a similar state and termination of disease to the above; one occurring without any apparent cause, the other seemingly from the pressure of a bandage in hernia. In one, published by Mr. Parkinson, ulceration and perforation of the appendix had taken place from the lodgment of a small portion of indurated fæces in it. A very interesting case, where violent abdominal symptoms were occasioned by a large lumbricus, which had passed into the cæcal appendage of a person otherwise diseased, is recorded by Mr. Blackadder. M. Thiery found this part engorged with fæcal matters, and inflamed, in a fatal case of ileus; the cæcum being narrowed, but not otherwise diseased. Heister met with the appendix inflamed and ulcerated after death, with similar symptoms. Amyand detected a small nail in this part after fatal ileus. Moreau and Kloeckhoff record instances of this disease produced by strangulation of the ileum by the cæcal appendage. Mr. Waldron discovered a small concretion in it after fatal peritonitis; and Morgagni, Van Doeveren, Sandifort, and several others, have detailed cases of both peritonitis and ileus, in which this part had adhered to adjoining parts; and, in some instances, a loop of intestine had been enclosed by it, and strictured. From the history of these and other cases, which have occurred to several of my medical friends, it may be inferred, that inflammation affecting primarily the cæcal appendage is most frequently brought on by hard substances having escaped into it; and that the inflammation rapidly extends to the peritoneum; giving rise to the exudation of albuminous lymph, to adhesion of its opposite surfaces, and of the appendix to adjoining parts, and to gangrene of this process.

20. Very acute pain, tumefaction, and tenderness, are complained of upon the invasion of this form of the disease, first in the right iliac region, and subsequently more or less over the abdomen; with excruciating tormina, obstinate constipation of the bowels, a very frequent, small, or contracted pulse, heat of skin, dry tongue, great thirst, sometimes with numbness of the right leg, or pain shooting down the thigh, and retraction of the testicle. Vomiting comes on sooner or later, and is often, at one period or another, attended by the discharge of matters from the small intestines — at least, in the cases which I have seen. The patient at last becomes restless, his countenance sunk, and a fatal termination takes place, generally from the third to the sixth day, preceded by the symptoms ushering in dissolution from intestinal peritonitis.

21. *D. Inflammation of the pericæcal tissue* is occasionally met with. Several interesting cases of it have been published by French writers, especially by MM. Dupuytren and Menière. Mr. Copeland has detailed a case where a urinary calculus was extracted from an abscess which opened externally, and communicated internally with the cavity of the cæcum. It is probable that the calculus, in passing along the ureter, had produced inflammation, extending to the cellular tissue exterior to the cæcum, and terminating in abscess, which had opened in both directions. In a case contained in Dr. Johnson's Journal, abscess had formed in the cellular tissue, external to the cæcum, had also burst into this viscus, and pointed externally: and a similar instance is recorded by M. Duplay. In all these a sinuous communication between the cavity of the intestine and external surface was formed. Several of the cases of inflammation of the cæcum and connecting tissue, detailed or referred to by M. Menière, terminated in suppuration, and opened either internally or in the right iliac fossa. In some of those published by M. Dupuytren, the purulent matter had infiltrated itself as high as the kidney, and as low in the pelvis as to collect between the rectum and bladder.

22. The *precursory symptoms* of this state of disease belong to pathological changes in the functions or coats of the cæcum itself, and are often similar to those already described as indicating acute or chronic inflammation of its mucous surface and follicles; the disease in such cases most probably arising from ulcerative perforation of the coats of the organ, or the extension of inflammation from its mucous surface. The patient frequently is first affected with either diarrhœa or constipation, or by both alternately, with colicky pains shooting in various directions, but generally radiating from the right iliac region; and he complains of pain or tenderness on pressure. To the above symptoms, others sooner or later are added, especially tumefaction, and constant pain in this part, and in the right iliac fossa, with anorexia, nausea, fever, and an irregular state of the bowels. As soon as suppuration commences, the disease presents the local and constitutional characters usually accompanying the formation of matter, with more or less tumour, which is generally situated deep in the iliac fossa.

23. Inflammation in this situation will, if recognised early and treated judiciously, terminate by resolution, in perhaps the majority of cases. But suppuration is almost as common a termination as resolution; and when it takes place, the abscess formed most frequently opens internally. In several instances, peritonitis has supervened, either previously or subsequently to suppuration, but more usually the latter. The abscess may also open externally, as in the cases already referred to; but seldom without it having also previously established a communication with the cavity of the cæcum.

24. iii. Chronic Inflammation of the Cæcum generally comes on primarily, slowly, and insidiously, and may be long limited to the internal surface and follicles of the intestine, as noticed above (§ 17.). It more rarely remains after acute attacks. In the former mode of appearance, it often advances imperceptibly, until serious organic changes have taken place in the coats of the organ; the general health, although more or less affected, not being so far injured as to alarm the patient. In its progress, it sometimes presents occasional accessions of severity, and even assumes

a sub-acute form. In other cases, an acute attack is superinduced, which may terminate in peritonitis, or in suppuration, or even in gangrene. Chronic inflammation is the most common organic state of disease by which the cæcum is affected.

25. *A. Causes.*—This form of inflammation of the cæcum is, I believe, most frequent in females, probably owing to contingencies connected with the uterine functions and child-bearing, and to their modes of dress. It often occurs among them previously to menstruation, or soon after the climacteric epoch. The use of unripe or acerb fruits; sedentary occupations, or want of exercise; the depressing passions; previous disorder of the digestive organs, particularly costiveness, and habitually, or occasionally, deferring the earlier intimations to evacuate the bowels; suppression of accustomed discharges, especially the hæmorrhoidal, the menstrual, and lochial; the pressure of an ill-constructed bandage for hernia; blows or contusions on the cæcal region; and occasionally too violent exercise on foot or on horseback; are its most usual exciting causes.

26. *B. Symptoms.*—At first the general health and strength are not much injured; but the patient loses his healthy appearance, and activity. He complains of colicky pains occurring occasionally, or even periodically, in the right iliac region, shooting through the abdomen, and recurring soon after a meal. The appetite is not materially affected, and flatulence is the most constant gastric symptom. The tongue is generally red at its point and edges, and loaded at its root; sickness and vomiting are not present; the pulse is often little affected, or it is quick and small; the patient lies on the right side, with the body bent and the thighs drawn up, and feels pain or uneasiness in the iliac region on turning to the left side, which is increased by continuing the position. The alvine evacuations are irregular and offensive, being at one time frequent, at another retained, generally muco-feculent, fluid, preceded by colic or slight tormina, and affording little relief. The abdomen, on examination, presents little remarkable, until we reach the cæcal region, where pressure occasions uneasiness, and a deeply seated fulness and hardness are usually detected. If much fulness or distension be present, the urine is generally voided frequently, and slight pain or numbness of the right thigh, with œdema of the right ankle, is often felt. If the disease go on to ulceration, blood will appear in the stools, which will also be of a more or less dark colour. Such are the usual symptoms, until some one of the acute states of the disease supervenes, when their attendant phenomena will indicate the change.

27. *C.* The *chronic state* of the disease may give rise to very great thickening of the parietes of the cæcum, either with or without dilatation of its cavity, and ulcerations in its internal surface. Fabricius Hildanus describes a case of this kind as one of cancerous ulceration; but it seems rather to have been chronic inflammation, with thickening and ulceration. Dr. Beezeley has detailed an interesting case very nearly of this description, wherein these changes were very remarkable. The patient complained of colic, constipation, flatulence, mucous bloody stools, and of a large tumour in the iliac region, which was mistaken for aneurism of the iliac artery. On inspection, *post mortem*, the coats of the cæcum were found above an inch in thickness, scirrhous, inflamed, ulcerated, perforated, and its cavity enlarged. When the disease has gone on to thickening, as indicated by the obscure hardness, and tumour, uneasiness, &c. in the iliac region, particularly if it be attended with ulceration, as may be inferred from the presence of small quantities of blood or pus mixed in fluid, or but little consistent, muco-feculent and offensive stools, amendment is procured with great difficulty, under the most favourable circumstances; but it should not be despaired of, although it may be long in appearing. I have met with severe cases, obviously of this description, where medical treatment was persisted in for many months, and one or two for some years, yet ultimately the health was re-established. In a case recorded by M. Emery, the cæcum was remarkably constricted, and the appendix filled with fæces. The patient died of ileus.

28. iv. Complications. —Inflammations of the cæcum, particularly of its internal surface, and in their sub-acute and chronic forms, with morbid enlargement and fungous ulceration of its follicles, are very frequently associated with dysentery and fever, in both temperate and warm climates. Inflammation of its external connecting tissue is much less common in these complications. I ascertained the fact of the intimate connection of inflammations of the cæcum with *dysentery*, in 1816, my attention having been first directed to it by the case already alluded to (§ 15.). Indeed, they generally constitute the original disease in dysentery; the irritative state of inflammation of the mucous surface and follicles of this viscus, together with the acrid secretions and other matters retained in it, producing an excoriating state of the discharges, whereby the cæcum itself is first affected, and subsequently those parts of the colon and rectum where they are the longest retained; an opposite morbid relation, however, obtains in respect of its complications with fevers, particularly those of a typhoid nature; for, while in dysentery it is frequently the primary affection, in fevers it is commonly a consecutive lesion arising from the morbid states of the secretions and matters, either retained in or passing through it, and from the disposition to change possessed by the mucous tissues and follicles during these diseases, particularly those of an asthenic character. It should not, however, be overlooked, that lesions of the cæcum may also arise in the course of dysentery, owing to similar states of the secretions and mucous surface of the intestines as are present in fevers; and that the cæcal disease will very generally escape detection during life, particularly in fevers, unless the attention of the practitioner is alive to its occurrence. In every case, therefore, should the region of this viscus be attentively examined; and, if symptoms indicating an affection of it be present, the means of cure should be directed accordingly.

29. v. Laceration, or *rupture* of the cæcum occurs in rare cases, either in consequence of previous disease and infarction of its cavity, or of external injury. Some instances of this occurrence are to be found in early volumes of the Philosophical Transactions, and in the Transactions of foreign medical societies. Soemmering, in his notes to the translation of Dr. Baillie's

Morbid Anatomy, mentions a case wherein it was produced by vomiting, which may have arisen from accumulation of morbid matters in the cæcum, with obstruction of its canal, and ulceration of its internal surface. Mr. SPEER and Mr. SHEWARD record instances of its rupture from contusion, — an event which is very likely to occur when an injury is sustained over it during distension of its cavity, from whatever cause. The consequence of its laceration generally is rapidly developed, and speedily fatal, peritonitis. *Introsusceptions* of this part, itself having passed into the colon, or portions of bowel having passed into it, are not infrequent, particularly in young subjects; but they require no particular notice, farther than as a cause of *ileus*, inflammation of *intestines*, &c.

30. vi. The PROGNOSIS in disease of the cæcum is very different in each of its forms.—*a.* When the *internal surface* is chiefly affected, recovery will take place in most of the cases, unless ulceration has commenced; and even then a favourable issue will sometimes follow judicious medical treatment and regimen. *b.* In the *acute states* of inflammation affecting the more external coats of the viscus, the prognosis is upon the whole unfavourable, at least it should be stated as such to the friends of the patient; and in every case it should be given with caution. *c.* If we suspect, from the severity of the symptoms, or from the rapid extension of inflammation from the cæcal region over the abdomen, that the *appendix is inflamed*, it is still more unfavourable; if, in addition to this circumstance, the retching be frequent, and more particularly if the matters ejected appear as having come from the small intestines, we may infer, not only that the cæcum or its appendage is most acutely inflamed, but also that either its canal is obstructed, or some adjoining part of the tube is strangulated; — in either case the prognosis is most unfavourable. The subsequent appearance of the symptoms usually indicating gangrene of the intestines leaves no hope, and is soon followed by dissolution. *d.* When considerable tumour, seated in the iliac fossa, and the signs of inflammation of the *pericæcal tissues*, are present (§ 22.), a favourable opinion of the issue may be entertained, if active treatment have been employed early in the disease, and the patient's constitution be not in fault. But in very many such cases, the general health has been much impaired previously to this disease, and has even predisposed to the attack. In such cases, as well as when evidence of the formation of *abscess* is observed, a very unfavourable, or at least a very cautious, prognosis ought to be given. *e.* In the *chronic states* of the disease any opinion should be offered with much reservation. If the disease have come on slowly, continued long, and the stools present the appearances indicating ulceration (§ 26.), an unfavourable state of disease exists; thickening of the coats of the viscus merely (§ 27.) is more favourable, but is not readily removed. *f.* The *complications* of this disease (§ 28.), particularly with typhoid fever, are attended by considerable danger. The association of it with dysentery is productive of the worst forms of that disease, as well as its complication with fever, of its most dangerous states; and causes the former to assume a chronic and obstinate form. *g. Laceration*, or rupture of the coats of the cæcum, is generally fatal in its results.

31. vii. TREATMENT.—*A.* Inflammation of the *internal surface* of the cæcum, and the *chronic states* of the disease (§ 17. 24.), require the application of a number of leeches either near the iliac region, or on the inside of the right thigh, and a repetition of them according to the circumstances of the case. In robust or plethoric persons, general depletion may precede the local. After the leeches are removed, fomentations and a succession of poultices will be found serviceable; after which, a full dose of calomel with James's powder, and, a few hours subsequently, a mild aperient medicine, should be exhibited, and an aperient action promoted by the administration, and frequent repetition, of demulcent, oleaginous, or saponaceous enemata (§ 13.). Drastic purgatives are seldom more efficacious than those of a milder kind, but are often attended with risk. I have generally found the infusion of rhubarb, with tartrate of potash, and the electuaries prescribed in the *Appendix* (F. 82. 89. 98.), most serviceable. In the majority of cases, the above means will remove all ailment. The treatment in other respects should be the same as is recommended in chronic *Diarrhœa* and in *Dysentery*. If functional disorder remain after the more inflammatory symptoms have subsided, a blister may be applied, or a deobstruent liniment (§ 13.) rubbed over the cæcal region night and morning; or a rubefacient and deobstruent plaster (§ 14.), worn for some months in this situation.

32. *B.* In the *more acute states* of the disease, general *blood-letting*, repeated according to the circumstances of the case, or followed by local depletions, and the same treatment subsequently as described above, must be early and decidedly employed. If there be vomiting, or retchings upon taking substances into the stomach, a large dose of calomel, — generally from 10 to 20 grains given either alone or with one or two grains of opium, — will allay this disorder. If the symptoms still continue, or if they be but slightly mitigated, blood-letting, general and local, followed by fomentations, poultices, and oleaginous enemata, having been carried as far as may be deemed prudent, the turpentine embrocation, (flannel cloths wrung dry out of very hot water, and immediately soaked with spirits of turpentine,) should be applied over the abdomen and retained there as long as it can be borne by the patient. If the tormina be severe, or if peritonitis have supervened, this is, after depletions have been practised with decision, the most efficacious means we possess. In a case of this disease, which had become complicated with peritonitis, in a member of the family of a medical friend, this means gave almost instant relief, after other measures had been carried to the utmost limits, and the patient soon afterwards recovered. In another instance of extreme danger similarly complicated, which very recently occurred, the repetition of this treatment removed all complaint, although resorted to in despair of success from it.

33. *C.* I have stated that *inflammation* of the *appendix cæci*, particularly when occasioned by hard bodies having passed into it, often does not extend to the cæcum itself, or, at most, only to its peritoneal coat, in common with the adjoining portions of this surface; but that the supervention,

the extension, and fatal termination of peritonitis in such cases are most rapid and dangerous, the appendix itself generally soon becoming gangrenous. It therefore behoves the practitioner to have recourse to the most decided measures, when he finds the symptoms of peritonitis originate in the cæcal region, and when retchings come on. Vascular depletion, and all the remedies already noticed, must be energetically and early employed; but premature attempts should not be made to evacuate the bowels, otherwise their action will be inverted, and decided symptoms of ileus will be produced. Fomentations should follow the leeches; and afterwards hot poultices should follow; which in their turn ought to give place to the terebinthinate embrocation, if requisite. A large dose of calomel and opium should, however, be given after the first full blood-letting; this will generally be retained, even in the worst cases; and it ought to be repeated according to circumstances, without fear of affecting the system by it, — an effect which it is even very desirable to produce. Little other medicine need be exhibited by the mouth, excepting draughts with nitrate of potash, or sub-carbonate of soda, or both, with agreeable demulcents and emollients, if the stomach will retain them. But the assiduous administration of *enemata* must not be neglected. It is entirely by their agency in this state of disease, that the bowels are to be evacuated, when it is judged prudent to fulfil this intention, which should seldom be omitted as far as they are calculated to accomplish it; more especially after depletions have been practised. The enemata prescribed in the *Appendix* (F. 130—151.), as they may appear suited to particular cases, may be employed. Pain, tormina, nausea, or vomiting, having been relieved, gentle cooling aperients, and in the interval diaphoretic medicines, may be exhibited by the mouth. Warm baths are seldom of much use in this malady; but when they will not interfere with the treatment prescribed, they may be tried, particularly in the more advanced periods. After the disease has been removed, and merely functional disorder remains, the measures already advised may be put in practice.

34. *D.* The treatment now described is also applicable to the early stages of inflammation affecting the *pericæcal tissues.* If suppuration takes place, the treatment recommended for *Abscess* must be resorted to; taking care to support the energies of life under it, particularly when the constitution or general health is in fault. If we suspect either the existence of *ulceration* or of *thickening* of the coats of the viscus (§ 27.), the assiduous employment of the liniments noticed above; of gentle aperients and deobstruents, particularly the infusion of rhubarb with soda or potash; of electuaries, with sulphur, cream of tartar and soda, or the sub-borate of soda; small doses of blue pill or hydr. cum creta, with ipecacuanha, hyoscyamus, and camphor; repeated blistering, and subsequently the deobstruent plasters; the frequent use of large oleaginous, saponaceous, and demulcent enemata, with the treatment recommended in chronic *dysentery;* are the measures most to be depended upon; with strict attention to diet, which should be chiefly farinaceous, to the state of the digestive organs generally, and to the secretions and excretions.

35. *E.* The *complication* of the disease with *dysentery* requires, in addition to the measures used for that disease, the application of leeches near the right iliac region, and the other external measures already noticed, with rhubarb aperients, combined with camphor, narcotics, and ipecacuanha; laxatives, with demulcents and anodynes; the frequent administration of oleaginous and emollient enemata; and the usual means of correcting the secretions, and diluting and carrying off the acrid and excoriating fluids, and fæcal matters in the intestinal canal. (See Dysentery — *its Treatment.*) A similar treatment to the above is necessary when the disease occurs in the progress of *fever.* Depletions, however, are generally not so well borne in this complication as in the former, and should therefore be carried to a less extent; but all the external remedies, and the use of laxatives, particularly those imparting a tonic effect to the intestinal mucous surface, should be often employed. Camphor, with hydrarg. cum creta and opium, or with ipecacuanha and rhubarb, terebinthinate injections, or even a terebinthinate draught in the worst cases, have proved most serviceable in this state of complication, in my practice. During recovery, the occasional use of the liniments and plasters above referred to, attention to the secreting and digestive functions, particularly to the state of the bowels, which should be occasionally assisted by emollient and laxative injections; and a regulated diet, easy travelling, change of air and of scene; are the chief measures requiring attention. (See the treatment of Fever.)

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CALCULI. See Concretions, *Biliary and Intestinal;* also Urinary Calculi, and Urine.)

CANCER. Syn. *Scirrhus, Carcinus, Schirro-Cancer, Carcinoma,* Auct. Var. *Cancer,* Fr. *Das Krebsgeschwür,* Ger. *Scirro, Canchero, Cancro,* Ital.

Classif. 4. *Class,* Local Diseases; 6. *Order,* Tumours (*Cullen*). 3. *Class,* Sanguineous Diseases; 4. *Order,* Cachexies (*Good*). IV. Class, IV. Order (*Author,* see *Preface*).

1. Defin. *A disease often arising from hereditary predisposition, in the middle or advanced periods of life; commencing with a local hardness,*

which subsequently softens in its centre, infects the adjoining parts, and ultimately contaminates the frame.

2. Cancer consists of two states or stages: the *first*, in which it presents the appearances usually denominated *scirrhus;* the *second*, in which it softens, ulcerates, &c., and degenerates into true *cancer*, or *carcinoma*. I shall describe each of these successively.

3. I. SCIRRHOUS STAGE. — *Occult cancer*. It commences with a tumour, a limited local hardness; is usually single; is very rarely, at its commencement, detected in different parts at once; and is not surrounded by a cyst. Several authors have stated the occurrence of a cyst; but OTTO more accurately excludes it from this structure. It is of importance to attend to the appearances of the disease at its commencement, as serving to indicate its nature. It is distinguished, at this period, by hardness, coldness, whiteness or paleness, insensibility, and deficiency of red blood vessels; — a state indicating the low grade of vital endowment of the part.

4. The scirrhous structure, when fully developed, consists of a firm, hard, rugged, incompressible, and unequal mass, the limits of which are not distinctly defined. Its colour is generally of a light grey, and, when cut into thin slices, it is semi-transparent. Upon close inspection, it is found to consist of two distinct substances; — the one hard, fibrous, and organised; the other soft, and apparently inorganic. The former composes the chief part of the diseased mass, and consists of septa, which are opaque, of a paler colour than the soft part, unequal in their length, breadth, and thickness, disposed in various directions; sometimes forming a nearly solid mass; in other instances, a number of cells or irregular cavities, which contain the soft part. This latter is sometimes semi-transparent of a bluish colour, and of the consistence of softened glue; at other times more opaque, softer, somewhat oleaginous, and like cream in colour and consistence.

5. The fibrous structure seems to be the cellular, or proper tissue of the part, in a state of induration and hypertrophy; assuming, in consequence of its increased density and bulk, an appearance similar to the fibrous or fibro-cartilaginous structure; whilst the softer portion, contained in the meshes and cells of the former, appears to be merely a morbid secretion poured out by the vessels nourishing the organised fibrous tissue, and is probably the exhalation of the part, either secreted in a modified state, or accumulated and changed by the disease of its containing structure. If this view be correct, the former, or organised part, may be considered as chiefly resulting from an altered state of nutrition in the seat of disease; whilst the latter, or inorganised portion, may be viewed as proceeding from a morbid secretion, — the diseased structure thus being a product of a disordered state of both the nutritive and secreting functions, most probably in consequence of alteration of the vital influence exerted by the ganglial nerves on the capillaries of the part.

6. The proportion of each of those two substances, and the modes of their distribution, vary very considerably in different scirrhous masses. This diversity seems to be owing to the different tissues in which they are developed, and to the modifications arising from temperament, local irritation, and various concurrent circumstances to which the patient may have been exposed. It has been attempted by Mr. ABERNETHY to arrange these varieties of scirrhus into species, and to designate them according to the natural structures which they most resemble. Thus he divides them into Mammary, Pancreatic, Tuberculous, &c.; but these different states of structure glide so insensibly into each other, and are so perfectly similar as respects their origin and consequences, that little practical advantage is derived from thus distinguishing them.

7. In some scirrhous tumours, the fibrous part of their structure is both most conspicuous and abundant, and is condensed into a solid mass, having the appearance of a centre or nucleus, whence radiate numerous septa in every direction. This is the most common appearance of the disease. In other instances, the tumour forms an uniformly hard mass, of an irregular shape, and of no very defined structure. In some cases, the organised part approaches more nearly to the cellular structure, its cells being filled with a soft matter which may be pressed out. Occasionally, cysts are formed within the tumour, of various sizes, containing a reddish, reddish brown, or a chocolate-coloured fluid. These cysts are lined by a smooth membrane, from which a fungous tumour sometimes sprouts out. In some instances, portions of the scirrhous mass are converted into a hard substance resembling cartilage, in which bony or calcareous depositions are occasionally found. When the scirrhous structure is formed in the substance of a gland, its limits cannot generally be accurately determined, the two structures apparently being inseparably connected. In some cases, the scirrhous tumour condenses the cellular tissue surrounding it, and hence it acquires a somewhat sacculated appearance. (WARDROP.)

8. At the commencement of scirrhous disease, the structure of the tissue or organ in which it is seated preserves for some time its aspect and colour, being changed merely in volume and density: sometimes, however, its volume is but little augmented, whilst its density is very much increased. As the disease advances, the proper tissue of the organ becomes more obscure, and verges nearer to that already described.

9. M. HECHT, of Strasbourg, analysed a portion of fully developed scirrhus of the mamma, and found 72 grains composed of 2 grains of albumen, 20 of gelatine, 20 of fibrine, 10 of a fluid fatty matter, and 20 of water and loss. He likewise analysed, by a similar process, 72 grains of scirrhous uterus, and found it to consist of 15 grains of gelatine, 10 of fibrine, 10 of oily or fatty matter, and 35 of water and loss. (LOBSTEIN, *Anat. Path.* t. i. p. 403.)

10. Scirrhous tumours do not always remain in the state now described; and the period during which they thus continue is not determinate. When once they commence, they seldom retrograde, and the part affected never is restored to its healthy state. It is chiefly in this respect that the early stages of scirrhus differ from simple induration proceeding from chronic inflammation. Scirrhus may remain nearly stationary for several years, occasioning but little constitutional disturbance; but generally an important

change takes place in its structure, and the disease afterwards makes rapid progress.

11. II. CARCINOMATOUS, or CANCEROUS STAGE. — *Open or ulcerated cancer*. After a time, portions of the scirrhous mass begin to soften, and pass into a state of unhealthy suppuration and ulceration, — unhealthy as respects the characters and progress of these processes, and their contaminating influence upon the whole frame. The soft or inorganic substance resolves itself into a thin ichorous matter, very different from pus; and disorganisation commences, generally about the centre of the mass, and extending towards that part of it which is nearest either the surface of the body or any of the natural openings. When this process commences, it is in that state which has been denominated CARCINOMA, or CANCER. When this change takes place, the diseased mass seldom increases much in bulk, but is destroyed by an ulcerative process. The disease now makes rapid progress, owing to the contamination of the adjoining structures by the morbid matter secreted by the ulcerating part, a portion of which matter is evidently absorbed, irritating the lymphatic glands, and vitiating the whole frame. In consequence of this infection, the powers of life sink, the soft solids become cachexied, and the progress of the local affection accelerated. At last the patient sinks from the contamination of the circulating fluids, and the different textures of the body; the blood being diminished in quantity, as well as otherwise altered.

12. When the skin covering a scirrhous tumour ulcerates, a fungus of a cauliflower appearance, and hard gristly structure, sometimes proceeds from the surface of the mass. In some cases, ulceration destroys both the fungus and the primary tumour. It has been observed by Sir E. HOME, that some cancerous sores have suddenly changed from a painful and malignant character, to a more healthy aspect at some part, and even have begun to cicatrize. This apparent amendment is never permanent, for, sooner or later, the ulcerative process is renewed, and the disease pursues its usual course. Dr. PARR (*Dict.* vol. i.) states, that he has seen several cases thus terminate spontaneously; but the patients were all soon afterwards cut off by internal disease; probably consisting of the internal developement, or metastasis of the malady, cases of which occurrence are not infrequent. (See *Journ. Hebdom.* t. i. p. 323. for a case wherein internal cancer appeared after the removal of the external disease by compression.)

13. Cancerous tumours generally contaminate the glands in the vicinity, particularly after ulceration has commenced. But these glands are seldom primarily affected. Mr. WARDROP states, in his excellent description of this disease, that he has only met with two cases of primary affection of the lymphatic glands. Besides these glands, various other organs and parts, sometimes far removed from the seat of the primary disease, become secondarily affected. This is most probably occasioned by contamination of the frame, from absorption of the morbid matter of the disease. Sometimes the existence of cancer in distant organs is not successive or secondary, but seemingly coeval. In this case the cause must be looked for in the originally morbid state of the system. Indeed, this state always obtains, to a certain extent; the disease being strictly constitutional even in its origin; the consecutive contamination, arising from the absorption of morbid matter from the primary tumour, merely augmenting the original vice, and accelerating its noxious effects.

14. Scirrho-cancer most commonly *originates* in glands whose functions have been interrupted, or that have never performed the offices intended for them; or it affects parts which have been previously diseased, or have received at some period an external injury. Thus it attacks the mammæ, the uterus, the ovaria, the testes, the thyroid glands. It also very frequently commences in the tegumental, and the digestive, and urino-genital mucous surfaces; more particularly in the skin of the face; in the mucous membrane of the nose, lips, mouth, pharynx, and œsophagus; in the stomach, especially the pylorus and cardia; in the intestinal canal, the ileo-cæcal valve, rectum, and anus, and in the urinary bladder. The viscera which are *secondarily* affected, are commonly the lungs, bronchial glands, the liver, the omentum, the mesentery, the spleen, the pancreas, the brain, the medulla of the bones, and the skin. Several of these, particularly the liver, pancreas, mesentery, brain, &c. may also be primarily or coevally affected with other parts. Scirrhus affects the skin in two forms; — the one is that of wart, the other that of tubercle — the former being primary, the latter secondary.

15. III. DIAGNOSIS. — It is of great importance to be able to distinguish between this disease and various others, for which it is liable to be mistaken. For instance, the simple induration proceeding from chronic inflammation has, in several instances which have come to my knowledge, been mistaken for scirrhus. This mistake not infrequently occurs in respect of induration of the neck of the uterus.

16. *A.* In *simple induration*, the part affected is redder, more injected, retains more of its original structure, is less indurated, and less lobulated, than scirrhus. The parts also surrounding the indurated portion are frequently slightly infiltrated with serum. Induration, the result of inflammatory action, admits of resolution, and entirely disappears, sometimes in consequence of a natural flux or evacuation, of active exercise, the return of accustomed discharges, or pregnancy. Thus the menstrual flux sometimes dissipates inflammatory induration of the mammæ, or of the neck of the uterus.

17. *B.* The *fibrous production* generally appears in the form of a rounded body, implanted, but isolated, in the proper structure of the organ, and adhering to it merely by means of laminated tissue. Upon dividing this structure, it grates under the scalpel; and it sometimes presents dilated vessels, which are never observed in scirrhous masses: moreover, it occasions little or no pain, and never passes into the cancerous state.

18. *C.* Compared with *tubercular* or *lardaceous* productions, scirrho-cancer offers remarkable differences: — 1st, This latter is never found isolated in the cellular tissue, or in the parenchyma of organs, in the form of granulations, or of small rounded tumours, as the tubercular formations are; nor in largely diffused masses, as the lardaceous substance: 2d, It is never enclosed in a cyst: 3d, It does not greatly increase the volume of the part it affects; sometimes the part is even

diminished, but much more dense: 4th, It is not susceptible of the same kind of softening as the tubercular and lardaceous productions; but rather of a peculiar rarefaction, passing into a peculiar form of fungus, followed by the developement of blood-vessels: 5th, Its vital properties are excited, and its sensibility becomes exalted, as the disease advances, — circumstances which are never observed in connection with these productions.

19. *D. Cancerous ulceration* is characterised by a jagged, thick, soft edge, which is turned outwards. The surface of the ulcer is greyish, or greyish brown, sometimes livid brown, elevated into loose, fungous vegetations, discharging a fœtid, corroding *sanies* or *ichor*, and bleeding slightly upon irritation. *a. Chronic inflammatory ulcers* differ from the former in the absence of a fœtid corroding ichor; in the hardness of their margin, which turns inwards; and in the reddish and more healthy appearance of their bottoms, which in cancer is colourless, or a livid brown, hard, irregular, fungous, sometimes with cauliform excrescences, and extremely offensive. *b. Local tumours* sometimes appear, particularly on the tongue, originating in irritation, and exasperated by the continuance of this cause. These usually commence with a small pimple or wart, becoming more and more hard and irritable as they increase, until they assume a scirrhus-like induration. They seldom endanger the constitution, yet appear sometimes to assume a malignant character. (Mr. EARLE, *in Trans. of Med. Chir. Soc.* vol. xii. art. 22.)

20. *E.* As soon as the *carcinomatous change* takes place in the scirrhous mass, the disease involves adjoining parts, and the system generally. The local suffering is more fully developed, and the vital actions of the part are changed greatly from the healthy course. The sensibility is morbidly augmented in short paroxysms; the pain being violent, and what is usually called *lancinating* or stinging during the exacerbations, but often slight, or almost altogether absent in the intervals. If the surface be exposed, the pain is burning, and the part is always sore. As the disease advances, and particularly as the ulceration proceeds, the paroxysms of lancinating and burning pains increase in violence, and the remissions become more imperfect, and of shorter duration. The *cancerous sanies* is generally very fluid; but its appearance varies with the treatment, the situation of the disease, and with the diet of the patient. It is generally of a greyish white, or reddish grey; it slightly effervesces with sulphuric acid, and turns syrop of violets to green.

21. *F.* The *extension* and *contamination* of the system characterising cancerous ulceration appear to be owing, 1st, to the corroding influence of the secretion on the parts with which it is in contact: 2d, to the absorption of a portion of the morbid secretion by the lymphatic vessels: this is evinced by the swelling and affection of the glands in the vicinity of the primary disease. But the affection of the glands may not be altogether owing to the absorption of the morbid matter, but partly to the irritation of the lymphatic vessels occasioned by the disease of the part in which they originate: and, 3d, to the absorbing function of the veins, according to the researches of MAYER, MAGENDIE, TIEDEMANN, GMELIN, &c. These different sources of contamination seem more than sufficient to account for the general cancerous cachexia characterising the advanced stages of the disease.

22. *G.* The characters of this *cancerous cachexia* are, emaciation; softness and flaccidity of the soft solids; œdema of the extremities; hectic fever; a peculiar change of the complexion and colour of the whole surface of the body, which become of a pale leaden, or pale straw colour, or waxy hue; and general depravation of the functions. This state of cachexia increases with the progress of the disease, and augments at the same time the primary local change. It is rapidly developed and increased when the scirrhous mass ulcerates, when also carcinomatous tumours frequently manifest themselves in various parts of the body. Ultimately the circulating fluid is deficient in quantity, and is poor and morbid; and the vital cohesion of the soft solids, and even of the bones, is diminished.

23. IV. CAUSES. — Scirrhus, like scrofula, is undoubtedly an hereditary malady. Instances are numerous of several individuals in the same family having been affected by it. It is almost altogether confined to persons advanced in life. Cases of the disease are very rare before the age of thirty. Sir A. COOPER met with it only twice previously to this age. Mr. WARDROP has seen one instance of it in the skin of a girl of twelve years. Females, owing to the liability of their appropriate organs to be attacked, are more subject to it than males; especially those who have not borne children, the disease generally appearing in them upon the cessation of the catamenia. The disease seems commonly to result from an original or acquired diathesis, existing previously to the developement of morbid structure, and very often connected with the lymphatic temperament. MM. BRESCHET and FERRUS found 23 instances of this temperament prominently marked, out of 44 cases of the disease. Anxiety and distress of mind, and all the depressing passions, are most disposing causes, particularly to cancer of the breast. An inactive state of the part for a considerable time previously; a poor, unwholesome diet; laborious and exhausting occupations, and an unhealthy locality; also dispose to it.

24. It is generally *excited* by blows and external injuries; by repeated or continued irritation; the abuse of spirituous liquors; and by low and poor diet. It is not liable to be propagated by contagion; the experiments of MM. ALIBERT, BIETT, and DUPUYTREN, having shown that the matter discharged from a cancerous ulcer cannot produce the disease in another person. Although irritating agents of any description may give occasion to its appearance, yet there must have previously existed cancerous diathesis, or constitutional disposition, in which it almost always originates.

25. The *proximate cause* of this dreadful disease is extremely obscure; and opinions respecting it have consequently been numerous. SCHAEFFER and GAMET consider it to be caused by a singular depravation of the nervous fluid. Dr. ADAMS and Dr. BARON impute it to the existence of an hydatiform body, which they call the *hydatis carcinomatosa;* and Mr. CARMICHAEL, to a body enjoying an independent state of existence developed in those parts of the frame, the vitality of which is enfeebled, and the organised matter of which begins to be decomposed. He supposes that, at first, this constituent of cancer occupies but a minute spot,

consists of a substance nearly similar to cartilage; and that it afterwards extends itself in the form of radiations, resembling ligaments formed by thickened cellular tissue. These opinions, which are not essentially different from each other, have been completely refuted by Burns, Cleri, and Himly. According to M. Broussais, scirrho-cancer is the result of an inflammatory or sub-inflammatory state of the vessels (*Examen des Doctrines Méd.* t. i. prop. 93—95.); and the opinions of M.M. Begin, Breschet, and Ferrus (*Dict. de Méd.* t. iv. p. 133.), differ but little from that of M. Broussais. They impute the disease to irritation of an inflammatory nature, occasioning the secretion of a coagulable lymph that becomes condensed into a scirrhous substance, which may remain stationary for a longer or shorter period, but which sooner or later undergoes a secondary inflammatory process, and experiences softening and disorganisation, with various other changes, as these processes proceed. To this doctrine of the modern French pathologists it may be objected, that scirrhus furnishes no sign, local or general, of inflammation, and yet it goes on increasing; and if it can increase rapidly without inflammation, may it not also originate independently of this cause? Where, therefore, neither the local appearances, nor the usual consequences, nor the constitutional symptoms, of inflammation can be perceived, ought we to impute disease to this state of vascular action? The inference is obvious; but it is only one of many arguments, which, if they were not superfluous, might be adduced against the doctrine.

26. According to M. Andral, cancer is not a specific alteration, but a state of disease arising from lesions of nutrition and secretion, which have reached the period of their termination in ulceration; the ulcer thus arising, constantly increasing either in depth or extent of surface, without any disposition to cicatrisation. Thus, M. Andral considers cancer in a generic acceptation, and comprises under it the ulcerative process in various species of disease of a constitutional origin and malignant nature, which, although always considered as closely allied, in their origin, nature, and tendency, to scirrhus, have usually been viewed as distinct maladies. This opinion is more in accordance with the wide signification of the term *cancer*, in the writings of French pathologists, but is very deficient in precision and applicability; inasmuch as it embraces the advanced states only of several organic changes, which, in their earlier periods especially, are very distinct from one another — distinct in causes, origin, the structures they principally attack, and in their appearances and properties. I have, therefore, adopted the more accurate views of British pathologists respecting this disease, which I consider in relation to its predisposing and exciting causes, to the states of the system in which it occurs, to its local appearances, and constitutional effects, to the results of treatment, and to the ultimate changes produced in the blood, and in the various structures, *as essentially depending upon a weakened and otherwise morbid state of the system generally; and arising from depravation of the vital conditions of the part affected, whereby its nutrition, nervous sensibility, and secreting function, become specifically changed, and all the fluids and solids ultimately contaminated.*

27. V. Treatment. — The conclusion now drawn respecting the nature and morbid relations of *scirrho-cancer* must render very apparent the futility of various measures which have been employed to remove it. Some writers have too exclusively viewed the disease as local; and thus, even in its advanced stages, resorted to most dangerous and painful operations to extirpate an evil, which, instead of being local, proceeds from the morbid state of the system generally, and which all depressing causes (the surgical operation itself being one) rapidly increase, disposing not only to its extension in its primary seat, but also to its appearance in new situations and more vital organs. The means of cure, therefore, should have especial reference to the state of the constitution favouring its developement and progress; for, when the malady is advanced, local measures can, at the best, only be palliative, and are there fore subsidiary to judiciously devised means employed internally, and assisted by suitable diet and regimen.

28. Before I proceed to state the indications which should guide the treatment of this disease, and the medicines which seem best calculated to fulfil them, as far as this is possible, I will take a brief view of the means which have been recommended or tried by preceding writers. The real importance of this subject to the physician will be the more obvious, when he reflects, that cancerous diseases are often — indeed most legitimately on all occasions — within his province, more particularly when they invade, as they frequently do, internal organs; and that the life of the patient may be greatly prolonged, and his sufferings much alleviated, by judicious medical treatment.

29. *A.* At the *commencement of the scirrhous stage*, various means have been employed, and sometimes with some advantage, according to the showing of those who employed them. *Conium* has, upon the whole, found the greatest number of supporters; and I think that, when it has been combined with the alkaline tonic and stomachic preparations, it has been often of considerable benefit. This seems to be nearly the opinion of several writers, and amongst others, of Gesner (*Beobacht.* b. i. p. 213., iii. p. 242.), Girard, Hufeland, (*Journ. der Pract. Heilk.* b. ix. 3 st. p. 86.), Hahnemann (in *Ibid.* b. ii. p. 473.), and Thilenius (*Med. und Chir. Bemerk.* p. 100.). Electricity and Galvanism have been employed by Brisbane (*Select Cases, &c.* p. 36.) and Walther (*Ueber die Ther. Ind. der Galv. Oper. &c.* c. 12.); the muriate of baryta, by Hufeland; antimonials, by Rowley and Dowmann; aconitum, by Greding; digitalis, by Mayer (*Richter's Chirur. Bibl.* b. v. p. 531.); laurel-water, by Thilenius; mercury, particularly the corrosive sublimate, by Ruysch, Thilenius, and Harris; sal-ammoniacum, by Justamond; belladonna by Gataker; and the mezereon, by Home (*Clin. Exper. and Hist.* p. 428.), with more or less benefit, chiefly of a temporary kind in those cases which were obviously scirrhous, and with permanent service in those which were only supposed to be of this description.

30. *B.* In the *more fully developed* and *less doubtful states* of the disease, as well as in its earliest stage, a number of medicines have been recommended, and for a while have obtained some credit, which few of them have long retained. The great majority, however, of them have been

brought forward rather as palliatives, and with the view of keeping the disease in check, than as possessing the power of curing it; yet some have been exhibited with more sanguine expectations, particularly arsenic, conium, hyoscyamus, and belladonna. *a.* That *conium* is productive of benefit, when judiciously combined with other remedies, is manifest, notwithstanding the contradictory evidence respecting it. While we find Stoerck (*Lib. de Cicut. Vind.* 1761. 8vo.), Fothergill (*Works*, vol. ii. p. 47.), Hamilton, Francke (*De Cancro. Ien.* 1778.), Nicolson (*Med. Obs. and Enquir.* vol. iv. n. 31.), Quarin (*De Cicuta*, ch. 4. 5.), Fearon, Bell (*On Ulcers*, pt. ii. sect. 8.), Gruelmann (*De Usu Cicutæ, &c.* Goet. 1785.), Renard (*Journ. de Med.* t. xxiii. p. 411.), Schaeffer, and several other writers, in favour of it, we observe, Siebold (*Chir. Tageb.* n. 74.), Lange, Hill (*Ed. Med. Comment.* vol. i. p. 146.), Akenside (*Trans. of Col. of Phys.* vol. i. n. 6.) Oberteuffer, (*Hufeland's Journ.* b. ix. st. 3. p. 81.), Schneider (*Chirurg. Gesch.* b. iv. n. 19.), and Burns, expressing opinions as to either its little efficacy, or its entire want of effect. This discrepancy may be accounted for upon the supposition of want of virtue in the preparations prescribed; the extract generally losing the virtues of the plant during the modes of preparing it formerly in use: and I find, upon referring to most of the authors now quoted, and to others not referred to, that the extract and decoction were usually employed by those who found it productive of no benefit; whilst the powdered leaves, the expressed juice of the plant, or an infusion of it, had been preferred by those who have expressed themselves in favour of it. I have prescribed the inspissated juice and powdered leaves of this plant, in several cases of internal scirrho-cancer, in combination with the alkalies and tonics, and have always found them much more beneficial when associated with it.

31. *b. Belladonna* was first exhibited by Alberti (*De Bellad. tanquam Specif. in Cancro, &c.* Halæ, 1739.), who highly praised it in the occult stage of the disease. It was afterwards recommended by Lambergen (*Haller's Disp. Pract.* ii. n. 41.), Bellot, Lentin (*Beobacht. &c.* n. 2. and 3.), Amoureux (*Journ. de Méd.* t. xiii. p. 47.), Camperdon (*Ibid.* t. lv. p. 342. 423—502.), Sulzer (in *Ibid.* t. xxiv. p. 68.), and by Grandvilliers (*Ibid.* t. xvi. p. 449.); and declared of little use by Zimmermann and De Haen (*Rat. Med.* pt. ii. p. 37.). I believe, however, that some advantage will be procured from its internal and external use, particularly as a palliative, and when combined with medicines which are calculated to support the energies of life, and improve the secreting and digestive functions. A similar opinion may be offered respecting *hyoscyamus.*

32. *c.* There is, perhaps, no medicine which has been so commonly prescribed in this malady as *arsenic.* It forms the base of the several secret remedies, internal as well as external, employed by empirics; and has been very generally used by them as an escharotic, sometimes with very injurious effects, from being absorbed largely into the system. There can be no doubt, however, of its beneficial influence, in many cases, when cautiously prescribed, and judiciously combined with other medicines; but chiefly as a most energetic tonic and excitant of the capillary vessels, and powerful detergent in the ulcerative stage of the disease. Justamond prescribed it both internally and externally, with opium and various other medicines; Stark (*Archiv. f. d. Geburtsh.* b. ii. p. 673.), Rush (*Edin. Med. Comment.* vol. xi. p. 312.), and Odhelius, state that they have found it cure incipient cancer, when applied in solution to the part; Collenbusch (in *Hufeland's Journ. d. Pract. Arzn. &c.* b. iii. p. 103.) found it beneficial when employed externally, tonic extracts having been given internally at the same time; Fischer (in *Richter's Chir. Bibliog.* b. viii. p. 76.), Michaelis (in *Ibid.* b. v. p. 132.), and Reusner, prescribed it in the form of the *powder of Guy** (composed of arsenic, sulphur, ranunculus sylvest., &c.), with marked benefit; Salmade (*Mém. de la Soc. d'Emulat.* t. i. p. 152.) cured a case with the *powder of Rousselot*, the twenty-fifth part of which, he says, consists of arsenic; Balascon de Tarare gave it with the expressed juice of the solanum, and Hornung with serpentary and soot. This evidence, however, in its favour, is not without powerful opposition. Fabricius Hildanus (*Cent.* vi. obs. 81.) says, that arsenic was introduced into practice by a monk named Theodoric, in the tenth or eleventh century (having probably been made acquainted with in the West), and details cases in which he considered it detrimental. A similar opinion has been entertained of it by Schneider, Thilenius (*Med. und Chir. Bemerk.* p. 101.), Acrel, Murray (*Med. Pr. Bibl.* b. iii. p. 485.), Adams, Oberteuffer (*Stark's N. Archiv*, b. iv. p. 673.), and Delius. Mr. Hill, however, expresses a very favourable opinion as to the effects of this mineral, and states that it will retard the progress of the true scirrhous tumour, in the great majority of cases, and often prevent it from becoming cancer (*Ed. Med. and Surg. Journ.* vol. vi. p. 58.). I believe that, when this medicine is cautiously employed, both internally and externally, in conjunction with narcotics and alkalies, or otherwise judiciously combined, Mr. Hill's opinion in its favour is not much too highly coloured.

33. *d.* The preparations of *mercury* are always injurious in this disease, when exhibited in any other manner than as an alterative, and, externally, as an astringent and stimulating wash. The oxymuriate, in minute doses internally, with the muriate of ammonia, or the compound sarsaparilla decoction, the tinctures of cinchona, with guiacum, &c., is often of service, at least in retarding the progress of its early stage; and when the disease has advanced to ulceration, the external use of the oxymuriate, with the muriate of ammonia, lime water, &c. may occasionally be of some service. Reidlin (*Cur. Med. Millen.* n. 408.), states, that the preparations of this mineral are always injurious when productive of salivation. Of the accuracy of this opinion, there can be no doubt. Prescribed, however, as now recommended, it has received the approbation of Moseley, Gooch, Gmelin (*Method. Cancrum Sanandi*, Tub. 1756.), Hagen, Gataker, Chapuis, Büchner (*De Med. Mercur. Usu in Cancro.* Hal. 1755.),

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* A secret remedy, recommended by Richard Guy, in a production, entitled *Essays on Scirrhous Tumours and Cancers*, 8vo. Lond. 1759.

Champelle (*Sur le Traitem. du Cancer*. Par. an viii.), and by Sir A. Cooper (*Lectures*, in *Lancet*, vol. iii. p. 190.)

34. *e.* The preparations of *iron* have been recommended by Justamond and De Mare (*Tract. Med. Chirurg. de Cancro, &c.* Vien. 8vo. 1767.), who gave them variously combined, particularly with muriate of ammonia, and in the state of neutral salts. Mr. Carmichael strenuously advises the sub-phosphate, combined with a little pure fixed alkali. He prefers this preparation, but occasionally also employs the carbonate, the tartrate of iron and potash, the phosphate and oxyphosphate of the metal. If it occasion costiveness, he combines with it a little aloes; and, if it produce headach, fever, or full pulse, he leaves it off, and gives four grains of camphor every five hours. He prescribes it as follows; directing *externally* to ulcerated cancers, the carbonates, phosphates, or arseniate of iron, made into a thin paste with water; and to occult cancer a lotion constantly applied, consisting of a strong solution of some one of the salts of this metal.

No. 85. ℞ Sub-phosph. Ferri gr. xxx.—℈ ij.; Potassæ vel Sodæ Puræ gr. iij.—v.; Extr. Aloës gr. iv.; Pulv. Glycyrrh. ℈ j.; Albumenis Ovi q. s. ut fiant Pilulæ xij. Capiat binas tertiis vel quartis horis.

Besides these preparations, the *ferrum ammoniatum* is entitled to notice. It was considered the best medicine that could be directed against this disease by Dr. Denman (*Observ. on the Cure of Cancer*, p. 77.).

35. *f.* The preparations of *lead* have also been used, chiefly externally, when the disease has advanced to ulceration. Gesner (*Beobach.* b. v. p. 141.) recommends the acetate in the form of liniment with turpentine, and Schoenheyder (*Soc. Med. Hann. Coll.* vol. i. n. 4.), advises the continued application of lotions of this salt in a decoction of conium. It has also been used in thin sheets constantly pressed upon the scirrhous tumour. Of the various other remedies brought forwards by authors at different periods, and stated by them to have proved serviceable, I may briefly notice the following: — Horstius (*Observ.* l. ix. ob. 3.) prescribed internally, and externally, *sulphur*, with spirit of turpentine; Ruland (*Cur. Ampir.* i. n. 92.), the *balsamum sulphuris;* and various other writers, the oleum sulphuris (F. 21.). The *sulphurets* have also been employed, both internally and externally, either alone, or with narcotics, and sometimes with benefit. Gataker (*Obser. on the Intern. Use of the Solanum.* Lond. 1757.) used the *solanum nigrum;* and Paulus Æginæ (l. iv. c. 25.), Oribasius (*Synop.* l. vii. c. 13.), and Carere, the expressed juice of the solanum *dulcamara*, externally; the last-named author exhibiting it internally at the same time. *Opium*, as well as other narcotics, is often necessary in order to alleviate the patient's sufferings, and with this view has chiefly been employed. I believe, however, that, when combined with suitable remedies, it is otherwise productive of benefit. The *volatile* and *fixed alkalies* have been exhibited by Barker (*New York Med. Repos.* vol. iv. n. 4.), Martinet and Barbette (*Journ. de Méd.* t. lvi. p. 559.); *antimonials*, by Rowley and Theden (*Bemerk.* b. ii. p. 86.); *barytes*, by Crawford (*Duncan's Med. Comment.* vol. xiv. p. 433.); *cinchona*, by Homburg, Vieussens, and Plenk (*Samml. von Beobacht.* i. n. 6.); the expressed juice of the *chelidonium* and the *sulphate of zinc*, by Berchelmann; *lime-water* by Vogel (*De Curat. Cancir. per Aquam Calcis Vivæ potam, &c.* Goet. 1769.); the *orobanche Virginiana*, by Barton and Bensell (*Philad. Med. Journ.*); an ointment with the juice of the *bardana* and *acetate of lead*, by Percy (*Hufeland N. Annalen*, i. p. 381.); *camphor*, by several authors; the *sedum acre*, by Buchoz and Quesnai; the *onopordum acanthium*, by Goelicke (*De Onopordo Carcin. Aver. &c. Fr.* 1739.), Handel, Juncker, and Ross; *myrrh*, by Nicolas (*Hufeland N. Annalen*, i. p. 362.); *fixed airs*, by Beddoes, Percival (*Essays*, ii. p. 73.), Ingenhousz, and Peyrilhé (*De Cancro*, p. 75.); *digitalis*, by Richter (*Chirurg. Bibl.* b. iv. p. 591.); the *hydro-sulphuret of ammonia*, by Burns; *petroleum*, by Rammazzini and Pierce; the *rhododendron chrysanthemum*, by Pallas; and *aconitum, sarsaparilla, guaiacum*, the *beccabunga*, the *phellandrium aquaticum*, &c. by various writers. All these have been prescribed both internally and externally, with little or no advantage, or with very temporary benefit only.

36. *g.* Of the numerous *external remedies* recommended at various periods, the preparations of arsenic and quicksilver; charcoal and carrot poultices; the mineral acids, particularly the oxymuriatic and chloric acids; the chlorurets, and many of the metallic salts; camphor, the balsams, and the terebinthinate substances; ammoniacum, galbanum, and myrrh; and the greater part of the astringent, antiseptic, detergent, and stimulating vegetable medicines, have obtained a greater degree of reputation; and, when some of them are judiciously combined with one another, and with narcotics, they are deserving of notice as discutients in the early stage of the disease, and as palliatives in its ulcerating state.

37. Frictions of the part were advised by Ponteau, and Young entertained sanguine expectations of the result of pressure, — a practice which, very recently, has received the support of Recamier, and several French physicians. M. Joubert states, that he has found small local blood-lettings, and the following pills, most serviceable in the different stages of cancer. (*Archives Gén.* vol. xvi. p. 282.)

No. 86. ℞ Saponis Medic. ʒ iv.; Gum. Ammoniaci ʒ ij.; Ext. Conii et Ext. Aconiti Nap. ʒ jss.; Massæ Pilul. Rufi ʒ j. M. Contunde benè simul, et divide in Pilulas gr. v.

He directs two of these to be taken night and morning, increasing the dose by an additional one daily, until twelve, fifteen, or even twenty, are taken, morning and night. The rest of the treatment consists in applying poultices of the recent conium; using deobstruent and solvent beverages, a mild diet and regimen, and wearing an issue or seton in the arm or thigh. This plan has likewise been advised by Dr. Lowassy, by whom it was first practised.

38. *h.* Sir A. Cooper expresses himself very strongly against low diet in this disease, — a practice which had been much insisted on by Mr. Pearson, Dr. Lambe, and Hufeland (*Journ. der Pract. Arzneik.* b. i. p. 289.) The opinion of Sir Astley is certainly in accordance with accurate observation, and rational induction. This very eminent surgeon states, that he has seen most benefit derived from Plummer's pill given at bed-time,

and stomachic tonics in the day, consisting chiefly of the bitter infusions, with ammonia, and the sub-carbonates of the alkalies. Some advantage was also derived from a pill, consisting of half a grain of stramonium, with two grains of camphor, given twice or thrice a day.

39. Since the introduction of *iodine* into practice, the preparations of it have been tried in the different stages of cancer by several physicians. The results of the trials which have been made of this substance are certainly such as ought to warrant the use of it in the early states of the disease. The cases recorded by Dr. Wagner (*Rév. Méd.* Juin, 1823.), and by Mr. Hill, of Chester, are much in favour of it. I have been consulted in two cases occurring in females between thirty and forty, for what was considered, by the attending practitioners, *scirrhus mammæ*, owing to the lancinating and remitting pains, and the diseased state of the nipple and axillary glands. They were both put upon a course of iodine (F. 328, 329.); and conium, with the sub-carbonates of potash, was given internally; a light nutritious diet, and strict attention to the state of the uterine functions, were also observed. Perfect recovery has taken place in both: but it appears doubtful whether or not they were genuine cases of scirrhus, notwithstanding the signs now alluded to were present. They had, however, withstood other means of cure for a long time. The treatment, in one of the cases, was chiefly conducted by Mr. Faxon, according to the above suggestions.

40. *C.* Conformably with the opinion stated above (§ 26.), I conceive that the treatment of this disease should be directed to the fulfilment of the following *intentions*: — 1st, To support the energies of life, by exciting the digestive functions, and the abdominal secretions and excretions; 2d, to soothe the morbid sensibility of the part, and promote the absorption of morbid depositions in its tissues, by means of anodynes combined with deobstruents and discutients; and, 3d, to impart vigour to the frame by suitable medicine, diet, and regimen. The remedies which are calculated to fulfil the first indication, may be often conjoined with those intended to accomplish the second and third; and both internal and external means may be simultaneously used, with those views. The medicines already enumerated comprise nearly all that have been found of any service in this distressing malady. But the advantage to be derived from them will mainly depend upon their combination and exhibition appropriately to the circumstances of individual cases.

41. The preparations of *iodine* given in very small and frequently repeated doses, with potass, and conium, or opium, will be found amongst the best remedies that can be used; inasmuch as, when exhibited in this manner, they are both tonic and deobstruent. They may also be used externally in the form of ointment; but one third of the proportion of hydriodate to the ointment usually employed should be prescribed, and friction with it ought to be of much longer continuance than commonly directed. Either stramonium, conium, opium, belladonna, hyoscyamus, or aconitum, may be given in various forms in the intervals between the exhibition of the iodine; and be combined with tonic infusions or decoctions, with the fixed or volatile alkalies, or with camphor in doses of from two to six grains. They may also be tried in conjunction with the preparations of arsenic, or of iron, or the chlorates of potash, soda, or lime, and as external applications also, when the disease has gone on to ulceration. In females, scirrho-cancer is generally connected, at its commencement, with disorder or the cessation of the menstrual discharge. In such cases, the preparations of iron with ammonia, or the fixed alkalies, and aloes, are sometimes of service. I have observed most advantage in these cases from frequent and full doses of conium, in the form of powder, given with the sub-borate of soda.

42. Tonic infusions, or decoctions, with liquor ammoniæ acetatis, or with the carbonates of the alkalies, and extract of conium, or the tincture of hyoscyamus; the oxymur. hydrarg. in the compound tincture of cinchona, or compound decoction of sarsaparilla; or small doses of blue pill, or hydrarg. cum creta, with camphor, and either of the narcotic extracts; the preparations of sulphur, and the sulphurets; the phosphates of iron, or this metal combined with ammonia, and conium; the sulphates of quinine and zinc; and the balsams and terebinthinates; may severally be employed.

No. 87. ℞ Decocti Cinchonæ ℥j.; Liq. Ammon. Acet. ʒij.; Liq. Ammon. ♏xx.; Extr. Conii gr. vj.; Tinct. Capsici Annui ♏viij. M. Fiat Haustus, ter die sumendus.

No. 88. ℞ Potassæ Sulphureti ʒjss.; Pulv. Fol. Belladonnæ ℈jss.; Saponis Castil. ʒj.; Gum. Ammoniaci ʒj. Syrup. Simp. q. s. Simul contunde, et divide massam in Pilulas lx. quarum capiat tres ad quatuor ter quotidiè.

No. 89. ℞ Infus. Anthemidis ℥jss.; Liq. Potassæ ♏x.; Tinct. Hyoscyami ʒss. M. Fiat Haustus, ter die capiendus.

No. 90. ℞ Hydrarg. cum Creta gr. j.; Camphoræ rasæ gr. iij.; Extr. Aconiti (vel Belladonnæ, vel Stramonii) gr. ss. ad gr. j.; Sodæ Sub-carbon. exsic. gr. viij.; Bals. Peruvian. q. s. ut fiant Pilulæ iij. mane nocteque sumendæ.

No. 91. ℞ Arsenici Albi gr. vj.—x.; Opii Puri gr. xij.—xx.; Oxydi Zinci ʒss.; Butyr. Recent. ℥j.; Ceræ Flavæ Liquef. ʒjss.; Longe triturat. misceantur exactiss. et f. Unguentum parti affectæ applic. (Harless, *De Arsen. Usu in Med. Norim.* 1811.)

No. 92. ℞ Extr. Conii mac., Balsam. Peruv., āā ʒj.; Plumbi Acet. ℈j.; Tinct. Belladonnæ ♏xij.; Tinct. Opii Comp. (F. 729.) ℈j.; Unguent. Ceræ ℥j. M. Fiat Unguentum.

No. 93. ℞ Ferri Ammoniati ʒjss.; Extr. Conii, ʒj.; Pulv. Capsici Annui ʒss.; Extr. Aconiti gr. iv. Camphoræ rasæ gr. xv.; Extr. Alöes purif. ℈j.; Syrup. Simp. q. s. M. Contunde benè simul, et divide in Pilulas xlviij. quarum capiat tres, ter, quaterve quotidiè.

No. 94. ℞ Herbæ Beccabungæ contus. ℥ij.; Pulv. Capsici Annui ʒjss.; Aquæ Ferventis Oj. Macera benè et cola. Dein adde Liq. colat. Solut. Arsenici ʒij. (vel Chlor. Calcis ʒjss.); Extr. Opii Aquos. ʒj. M. Fiat Lotio, pro parte affecta.

No. 95. ℞ Balsam. Canad. ʒjss.; Oxyd. Zinci ℈ij.; (vel Sub-carb. Potassæ exsic. ʒj.); Pulv. Folii Conii ℈ij.; Pulv. Capsici ℈jss.; Pulv. Tragacanth. Comp. q. s. ut fiat Massa Pilularis, quam divide in Pilulas xlviij. Capiat tres ter die; et augeatur dosis ad quatuor quater quotidiè.

43. *D.* Although the malady obviously has a constitutional origin, yet the propriety of *extirpating the affected part*, as soon as the true scirrhous character becomes manifest, may be conceded. After this is accomplished, the constitutional vice may be more successfully combated, and the reappearance of the local disease more probably prevented than at a later period. When, however, the system exhibits any of the symptoms of the cancerous cachexia, whether the adjoining glands be enlarged or not, nothing will be gained by an operation; but some advantage may still accrue from judicious and energetic medical treatment, particularly from tonics combined with anodynes, alteratives, and deobstruents. Whilst medical

measures have often obtained the credit they by no means deserved, from the circumstance of local diseases mistaken for scirrhus having been removed by them; so I believe that surgical operations have sometimes acquired reputation from the same cause.

44. During the treatment of this malady, attention must be especially directed to the secretions and evacuations. The bowels ought to be kept freely open, with deobstruent laxatives, combined with tonics and vegetable bitters. The diet should be nutritious, and easy of digestion. Pork, in every state, ought to be avoided, as well as other indigestible kinds of meat. Change of air, and of scene, with agreeable amusements, serve essentially in assisting the influence of a judiciously devised method of cure, and should, therefore, not be overlooked by the practitioner; and several of the tonic and deobstruent mineral waters are of use, particularly those of Bath, Tunbridge, Buxton, Spa, &c.

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CARCINOMA. See CANCER.

CARDIALGIA. See INDIGESTION.

CARDITIS. See HEART, *Inflammation of*, &c.

CATALEPSY AND CATALEPTIC ECSTASY.

CLASSIF. 2. *Class*, Nervous Diseases; 1. *Order*, Comatose Affections (*Cullen*). 4. *Class*, Diseases of the Nervous Function; 4. *Order*, Affecting the Sensorial Powers (*Good*). II. CLASS, III. ORDER (*Author*, see *Preface*).

1. *Catalepsy* and *Ecstasy*, although treated of by some writers as distinct affections, generally present very nearly the same pathological conditions, as respects the presumed states of circulation in the brain, of vital energy, and of nervous influence; manifest similar morbid relations and complications, in their origin and progress; are so far modified in their symptoms, as frequently to pass insensibly into each other; and therefore require, according to such manifestations, a treatment in all respects the same. For these reasons I shall consider them, in this article, as varieties of the same species of disease; and, if nothing more be gained by thus connecting them, repetition will be, at least, avoided.

I. CATALEPSY — TRANCE (from *καταληψις*, the action of seizing, and that from *καταλαμϐάνω*, I seize). SYN. *Καταληψις*, Greek. *Catalepsia*, *Catalepsis*, *Catochus*, *Prehensio*, *Congelatio*, Auct. Lat. *Carus Ecstasis*, *Carus Catalepsia*, Good. *Entonia Catalepsis*, Young. *Catalepsie*, Fr. *Die Starrsucht*, *Katalepsis*, Ger. *Catalepia*, Ital. *Trance*.

2. DEFIN. *A sudden deprivation of sense, intelligence, and voluntary motion, the patient retaining the same position, during the paroxysm, in which he was at the moment of attack, or in which he may be placed during its continuance; the pulse and respiration being but little affected.*

3. This disease is very rare; so much so, that its existence has been doubted by many writers, who consider it to have been feigned. Its occasional occurrence is, however, well ascertained. I have seen one case of it in my own practice, and been consulted by letter respecting a second. I recollect, also, an undoubted example of it in an hospital, the practice of which I attended when a student. It presents no precise or undeviating train of symptoms, but varies in many particulars; the phenomena noticed in the definition being those most uniformly present. This varying character of the disease, according to the description given of it by authors, is owing to two circumstances; — 1st, to the modified state which it actually assumes, from the circumstances connected with its origin; and, 2dly, to certain of its phenomena having been more particularly noticed by some authors than by others, who have either mentioned them incidentally, or entirely overlooked them.

4. SYMPTOMS. — This is an intermittent and apyrexial disease, occurring in paroxysms of variable duration; and generally after very irregular intervals. The seizure is occasionally announced by premonitory symptoms, — by headach, mutability of temper, yawning, tinnitus aurium, vertigo, palpitations, lassitude, pain or slight spasm of the limbs or neck, confusion of mind, &c.; but it is commonly sudden, — the patient retaining the same expression of the countenance, and posture of the body, as at the moment of attack. The eyes are fixed, are open or shut, the pupils usually dilated, but contractile from a strong light; and, from their unvarying expression, and the unchanged attitude, the body has the appearance of a statue. Any position, in which the head, trunk, or limbs are placed, is retained without deviation; the passive contractility of both the flexor and extensor muscles being such as to admit of a change as well as retention of the position during the paroxysm. The evacuations are either suspended during the fit, or passed involuntarily.

5. After a very indefinite duration — sometimes of only a few minutes, at others of several or even many hours, but rarely of days — the patient is restored to consciousness. In a remarkable case, however, detailed by Dr. BURROWS, the fit lasted many days. Restoration is usually instantaneous, accompanied with sighing, and followed by pain or confusion in the head, and a sense of fatigue and lassitude. The patient has no recollection of what has passed during the fit: and the same ideas, and, according to some, even the same sentences, which had been suspended by the seizure, have been pursued, the moment of recovery.

6. The countenance, during the paroxysm, is sometimes little changed; at other times, it is paler than usual; but it is more commonly slightly suffused, and the pulsations of the carotids more forcible than natural. The respiration is variable, sometimes it is embarrassed: the temperature of the surface is also unequal; being generally depressed in the extremities and increased in the head, evincing an irregular distribution of the circulation. The pulse is occasionally very slow: Sauvages found it only 50; but it is more commonly quick and small. The senses are so entirely abolished, that the patient may be pinched, without feeling it; and he cannot hear the loudest noises. The state of the muscles during the attack varies somewhat in different cases. They are often slightly rigid, but not to the extent of preventing the easy change of position of the limbs; and sometimes the position so permanently retained is one, which no person in health could so long preserve. M. Georget states, that the muscles often present a degree of tetanic rigidity; but this is only sometimes the case, particularly when the disease is more nearly allied to *Ecstasy*. In some cases, it would seem as if a partial state of volition existed, of which the patient either had no consciousness, or a very imperfect consciousness at the time, and consequently, no recollection of the act subsequently, as in some states of sleep.

7. In the more complete seizures, sense, intelligence, voluntary motion, and consciousness, are entirely abolished; but, in some instances, the abolition is only partial; the patient being conscious, but incapable of moving or speaking. This imperfect form of the disease has very generally received the appellation of *catochus* from nosologists; and numerous instances of it are on record. A very marked case, and nearly approaching to fully formed catalepsy, is recorded in the *Edinburgh Medical Commentaries*, by Dr. Fitzpatrick; and slighter grades of it have been met with as a subordinate symptom of chronic nervous diseases, particularly of the severe and obstinate forms of hysteria. In a case, however, of well-marked *catochus*, in a female, detailed by Dr. Lubbock, no hysterical symptoms existed; and, instead of unusual susceptibility of the system having been observed, in this and other cases which he had met with, more than common torpor was apparent. M. Petetin and others, who believe in animal magnetism, conceive that sensation, instead of being lost for the time, is concentrated towards the epigastric region; and that the intelligence, so far from being altogether abolished, is exalted to a degree to amount almost to prophecy. But these opinions can only be applicable to ecstasy.

II. Cataleptic Ecstasy. *Ecstasis*, *Ecstasy* (from εκστασις, from εξίστημι). Syn. *Extase*, Fr. *Entzückung*, *Begeisterung*, Ger. *Estasi*, Ital. *Ecstatic Trance*.

8. Defin. *Suspension of consciousness of external objects, and of voluntary motion, arising from, and attended by, a high degree of mental excitement and abstracted contemplation, the muscles continuing more or less rigidly contracted, or only partially relaxed.*

9. Under the term ecstacy, Dr. Good has described a variety of catalepsy, but little different from the usual appearance of that form of seizure, instead of the particular modification of disease to which the name ecstasy has usually been applied. This variety of cataleptic disorder is generally induced by mental excitement and sustained contemplation of some particular subject, most generally of religious topics, and of those exciting the affections and passions. The patient suddenly seems mentally struck, or carried away from all external objects; either standing or sitting in a most excited and impassioned position, with the eyes fixed and open; and sometimes uttering either the most enthusiastic and fervid expressions, or the most earnest denunciations and warnings, or the most absurd exclamations, with the feeling or belief of their reality; and total abstraction from, or unconsciousness of, all surrounding objects or persons.

10. This affection is variously modified. In some cases it very nearly approaches to pure catalepsy; in others, to a sort of maniacal excitement. Dr. Chisholm records an instance of this latter state in a young female, in whom it alternated with mania; and I was consulted by a practitioner in the country, respecting a most marked case occurring in a religious young lady, where it was evidently connected with, if not consisting of, an exalted form of hysteria. During the attack, she sung and composed long doggerel strains. Many of the cases which have lately made so much noise in this metropolis, under the idea of inspiration with "unknown tongues," evidently belong to this affection; at least, such of them as have not been feigned. The effects produced by the practisers of animal magnetism, upon nervous persons, sometimes appear allied to this affection. Many of the Italian improvvisatori are possessed of this faculty only whilst they are in a state of ecstatic trance, similar to this disease. And few of them enjoy good health, or consider their faculty otherwise than a morbid one.

11. The Terminations of Cataleptic and Ecstatic Seizures are generally either in health, or in disease of the cerebral functions. They may pass into mania, epilepsy, or confirmed insanity. Dr. Burrows's case, already alluded to, was complicated with mania, following excited and ungratified passions, and interruption of the menses. Recovery, however, took place, and the patient afterwards bore children. Dr. Gooch met with a case which supervened on, and was followed by, melancholia. J. Frank treated a case of catalepsy, that terminated in mania, of which the patient at last recovered; and Behrends details the history of a case complicated with mania. Pinel records a case of catalepsy which terminated in apoplexy. Rostan states, that he has observed a case in which inflammation of the lungs was associated with it. In many instances, these affections terminate, as they commence, in most severe hysteria; with which a very large proportion of them are more or less intimately allied.

12. But little is known of their relation to morbid states of the brain or viscera. Holier, however, informs us, that he found the vessels of the brain and cerebellum distended with black blood, and slight extravasation in a case which terminated fatally. Lieutaud and Ab Heers make mention of fibrinous concretions formed in the longitudinal sinus, with disease of the lungs and liver. According to the state of the counte-

nance, temperature of the head, and action of the carotid arteries, during the fit, it may be inferred that active congestion, or an efflux of blood, far beyond what obtains in health, takes place to the brain, and is instrumental in the production of the disease.

13. PROGNOSIS. — These affections do not appear to be attended with much danger. The fully formed cataleptic seizure is, however, a serious disease. The cases already adduced in illustration of its termination are sufficient to indicate this. Fatal cases are, however, noticed by HOLLIER, DODONŒUS, and the authors just quoted. AETIUS, DE LA TOUR, FAHR, and SAUVAGES, state that they have seen it disappear after copious epistaxis, and return of the menses.

14. CAUSES OF CATALEPTIC SEIZURES. — *A.* The *predisposing causes* are, whatever diminishes vital power, and increases the susceptibility of the nervous system, particularly the depressing passions, violent and continued sorrow, great anxiety, unrequited affection, intense and sustained mental applications, religious contemplations, exhaustion from repeated miscarriages or severe confinements, and excessive venereal indulgences and manustupration. The hysterical, hypochondriacal, and melancholic temperaments, are evidently most disposed to these attacks. They occur at all ages, from six or seven years till old age; but they are very rare before puberty; and are much more frequent in females than in males.

15. *B.* These affections are most commonly *excited* by some violent mental impression; by certain of the above predisposing causes, when acting intensely, particularly religious enthusiasm; great mental application, and the passion of love; frights, terror, or uncommon dread; the irritation of worms in the prima via; suppression of the menses, of eruptions and accustomed discharges; injuries of the head (STARK); concealed mental emotions, and ungratified passions; and disturbance of the uterine functions. RENARD (*Hufeland's Journ. die Pr. Heilk.* June, 1815.) relates a case which was occasioned by disease of the ovaria. SPRENGEL states, that these seizures are induced by onanism. J. FRANK remarks, " nunquam catalepsin in Judæis observavi, ac onaniæ vitium rarius inter eos, quam alias apud gentes inveni." (*Prax. Med. Univ. Præcip.* v. ii. p. 487.) I believe that many cases in females are chiefly exalted or more severe states of hysterical affection; and more or less connected with disorder of the nerves and circulation in the uterus and ovaria.

16. DIAGNOSIS and PROGNOSIS. — The practitioner must not overlook the fact of all those affections being frequently feigned, particularly by females, even by those in good circumstances, and when there can be no end to serve by the imposture further than to create interest in their behalf. Although cataleptic and ecstatic seizures pass insensibly into each other, and are in their nature obviously very intimately related, yet their more extreme and distinct forms are very different. In the *former* affection, the patient resembles a statue, is entirely deprived of voluntary motion, and is perfectly mute: in the *latter*, the countenance is animated and earnest; the muscles are more or less rigid; the patient talks, exclaims, or even sings with the utmost ardour; and the character of the whole frame is that of the most abstracted and intense contemplative excitement; consciousness of all other objects and ideas, excepting of the particular subject by which the mind is excited, being abolished: but the consciousness is often of a morbid or imaginative kind; the patient conceiving, as in the instances adduced by TISSOT, that he has seen wonderful visions, and heard singular revelations. *Ecstacy* may be confounded with *somnambulism* and *reverie*. The excited, and, as it were, inspired appearance of the patient, in the former affection, is sufficient to distinguish it from the more passive character of the latter, in both of which he resembles a person half asleep, or sleep-walking. The statue-like appearance and muteness of the *cataleptic* are alone sufficient to distinguish this disease from these latter affections. (See § 4—6.).

17. Catalepsy may also be mistaken for asphyxia, syncope, apoplexy, and even for death itself. The total suspension, however, of respiration and circulation, the deep colour of the lips and countenance, in *asphyxia;* the flexibility of the limbs, great paleness of the face, and the scarcely perceptible performance of the respiratory and circulating functions, in *syncope;* and the congestion of the head and face, the stertorous breathing, relaxed and flexible limbs, and the attendant paralysis, in *apoplexy;* are sufficient of themselves to distinguish it from any of the modifications of the affection now under consideration. It is possible, also, that a cataleptic patient may be considered as being dead. There are many instances on record, where persons in a state of trance have narrowly escaped being buried alive; and there is even reason to suppose that, in countries where burial usually takes place much sooner after dissolution than in this, such a circumstance has actually occurred. But this could never have occurred, unless the respiration and pulse had been suppressed, and the countenance pale. The stethoscope may now possibly prevent such an occurrence from taking place, by detecting the feeble action of the heart, which can never be altogether extinct in catalepsy. The states of the sphincters, and of the cornea, and the temperature of the trunk of the body, will further serve to prevent so distressing a mistake from ever occurring, even independently of due reservation of the body from inhumation, till indubitable proofs of death show themselves. As to discovery of feigned seizures of these affections, the general characters of the case, and the practitioner's own acumen, must be the chief guides.

18. TREATMENT. — When we consider that evidence of determination, or of active congestion, of blood in the head, has generally been furnished in these affections, the propriety of *vascular depletion* will not be disputed. If the signs of general or local plethora be very manifest, and if the disease have any relation to suppression of the menses, cupping between the shoulders, the application of a number of leeches to the nape of the neck and behind the ears, stimulating pediluvia, and bleeding from the feet, should be employed. If the temperature of the head, and the action of the carotids be increased, the *affusion of cold water* on the head, or the use of cold or evaporating lotions in this quarter, whilst the lower extremities are plunged in warm water, will be of service. In addition to these, *purgatives* should be given by the mouth, and repeated; a constant, but moderate action, being thereby exerted upon

the bowels; and antispasmodic or turpentine enemata should be administered from time to time. (See F. 130. 135. 150. 152.). The aloetic purgatives (F. 450—455. 470. 518.), are particularly eligible, when the affection is connected with irregularity of the menstrual evacuation. Diedier advises active hydragogue cathartics.

19. The above means are equally applicable to the paroxysm, and the interval, or suppression of accustomed evacuations, in cases characterised by plethora, or local determination of blood. If resorted to in the fit, they may be conjoined with various *antispasmodics*, as valerian, musk, ether, assafœtida, camphor, ammonia, &c., and volatile stimuli may be occasionally held to the nostrils, when the face is pale, and signs of determination of blood to the head are wanting.

20. The utmost attention should be directed, during the intervals, to the state of the uterine organs. If signs of congestion or of irritation are detected in this quarter, *cupping* on the loins, the application of *leeches* to the groins and tops of the thighs, and the internal use of the boracic acid, or of the sub-borate of soda, combined with refrigerants and anodynes, should be resorted to. The frequent association of these complaints with hysteria indicates the propriety of having recourse to a nearly similar treatment to that recommended in it, and to the same appropriation of medicinal means. Behrends attaches considerable importance to the state of the stomach and prima via in cataleptic seizures. There can be no doubt of the functions of these organs being often impeded or disordered, and of the propriety of restoring them to a healthy state. This can be done only by a judicious combination of *tonic* and *aperient*, or of *deobstruent* medicines.

21. When these affections have arisen, as they not infrequently do, from depressing or exhausting causes, the judicious combination of *tonics* with gentle aperients and *antispasmodics*, will be of much service. The shower-bath, salt water bathing, change of air, tonic and deobstruent mineral waters, regular exercise, early rising, and mental amusement, will be most advantageous in such cases. Several of the causes of the disease are both of an exhausting nature, as respects the constitutional energies, and of an exciting kind, in regard of the cerebral organs, particularly some of those which induce the ecstatic form of seizure (§ 8—10.). In these, it will be necessary to diminish the local determination to the brain, which is generally present, by the means indicated above (§ 18.), whilst we soothe the nervous system, and restore the digestive functions and the energies of the frame. To accomplish these ends, we must resort to a combination or alternation of tonics with anodynes, antispasmodics, and aperients (F. 453. 572.), keeping at the same time the head cool, the secretions and evacuations free, the mind amused and disengaged, the feet warm, and the blood as regularly distributed throughout the body as possible.

22. When the disease is complicated with mania, melancholia, or epilepsy, similar means to those already stated may be employed, appropriately to the state of vascular excitement and vital powers, and to the symptoms more immediately connected with the brain and the uterine organs. In several cases of these complications, full and frequent doses of calomel will be of service, and, under careful supervision, it may be judicious to exhibit, in conjunction with anodyne, nervine, or antispasmodic remedies, the milder preparations of mercury, until the mouth is slightly affected. In all cases where the above means fail of producing the expected effect, and particularly in these complications, issues, or setons, perpetual blisters, or the tartarised antimonial ointment, or moxas, should be directed to the nape of the neck, the occiput, or behind the ears, and perseveringly continued. In most instances, whether simple or complicated, after the affection of the mouth by mercurials, or the long continued use of setons, &c., the more tonic and restorative means advised above should be prescribed. Amongst the various antispasmodic medicines recommended by authors on these affections, I may notice the different antispasmodic gums, by Stark (*Klin. Instit.* p. 172.); the ammoniated copper, by Theussink (*Samml. Auserl. Abh. für Pract. Aerzte*, b. xvii. p. 279.); electricity, by Ledra and Sigaud la Fond (*De l'Elect. Méd.* p. 396.); the cautery to the occiput, by Blankard (*Collect. Med. Phys.* cent. v. No. 18.); and cinchona combined with valerian. The different preparations of iron, and various antispasmodics, have been recommended by Dr. Lubbock, and exhibited by him in a case where, however, they appeared of little service, most advantage having been derived from travelling, pure air, and agreeable mental occupations. (*Edinb. Med. and Surg. Journ.* vol. i. p. 61.). During the whole course of treatment, the strictest reference ought to be had to the nature of the predisposing and exciting causes, the habits and practices of the patient, and to his diet, and physical and moral regimen.

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CATARRH. — Simple Catarrh. Syn. *Catarrhus* (from καταῤῥέω, defluo). *Gravedo*, *Coryza*, *Bronchos*, *Catarrheuma*, *Fluxio*, *Rheuma*, *Capiplenium*, Auct. Var. *Catarrhus simplex*, Richter. *Phlegmhymenitis* (from φλεγμα, mucus, and ὑμεν, a membrane), Hildenbrand. *Catarrhe, Rhume, Fluxion,* Fr. *Ein Fluss, Schnupfen, Katarrh,* Ger. *Catarro, Reuma,* Ital. *A Defluxion, a Cold.*

Classif. 1. *Class,* Fevers; *Order,* Fluxes (*Cullen*). 3. *Class,* Sanguineous Function; 2. *Order,* Inflammations (*Good*). II. Class, I. Order (*Author,* see *Preface*).

1. Defin. *Sneezing, watery discharge from the nostrils; lachrymose state of the eyes; slight gravative headach, chillness, evening fever, sometimes accompanied with sore throat, hoarseness, and cough.*

Path. Defin. *Specific irritation of the mucous surface of the nostrils, extending to the frontal sinuses and eyes, in one direction; to the posterior nares, fauces, and throat, in another; and occasionally also to the pharynx, œsophagus, glottis, and trachea, thus terminating in catarrhal bronchitis.*

2. Although the most common of all diseases, there are few which are less understood, or have called forth a greater diversity of opinion, than catarrh. This uncertainty is chiefly owing to its varying characters, arising from the limitation or extension of its seat, the temperament and habit of body of the patient, the causes which occasion it, and the severity of the attack. If the affection be not extended much beyond the Schneiderian membrane, it very generally receives the name of *coryza,* or catarrhal coryza; if it be seated in the frontal sinuses it is called *gravedo,* or catarrhal cephalalgia; if in both these situations, a cold in the head; if the fauces be its principal seat, catarrhal cynanche, or catarrhal sore throat; if the glottis and pharynx, catarrhal cough and hoarseness; if it advance to the trachea and bronchi, catarrhal bronchitis; and if the eyes be primarily affected, catarrhal ophthalmia. It may thus be limited to any one of those situations, or be extended to two, or more, or even all of them, according to the predisposition of the parts and of the person affected. It may even proceed further, as to the air-passages on the one hand, or to the œsophagus and digestive organs on the other, after having subsided in, or disappeared from, its primary seat; and it may even be coexistent in several, or even all of these situations. x

3. If we consider the origin and phenomena of catarrhal affections, we shall observe many characters warranting an analogy between them and rheumatism on the one side, and erysipelas on the other. Catarrh is a disorder proper to mucous membranes, and is not limited to the parts of this tissue above specified. The same causes which occasion it in them, will sometimes, although much less frequently, excite it in other parts of this system, according to morbid predisposition of the organs. Rheumatism is an affection of the fibrous, sero-fibrous, and aponeurotic structures, and generally proceeds from the same or very similar causes to those which produce catarrh; they are both also often present at the same time, and in the same person, and the epidemic prevalence of both is not uncommon. Erysipelas is an affection of the skin, also often depending upon similar causes to those which produce catarrh and rheumatism, particularly those connected with the states of the atmosphere; and all of them are benefited more or less by a nearly similar treatment. Neither of these diseases is the same as true inflammation, although presenting more or less of the inflammatory characters, but also some which are proper to each. On this account, therefore, should they be viewed, even when approaching the nearest to inflammation, as essentially specific diseases; possessing, however, certain symptoms in common with one another, and with inflammation; the same causes acting on a certain number of individuals, producing catarrh in many, rheumatism in some, erysipelas in a few, and true inflammation in others, according to the diathesis, habit of body, state of the abdominal functions, previous disorder, &c. of the affected.

4. I. Causes. — *A.* The *predisposing causes* of catarrh are referrible chiefly to original conformation and diathesis, and to previous disorder, particularly as respects the state of the digestive and assimilating organs. It most frequently affects persons of a phlegmatic temperament, relaxed habit of body, and delicate constitution, or who are weakened by any cause, particularly by morbidly increased secretions and discharges; also those with long necks and narrow chests, or who indulge in warm apartments and beds, who rise late, and take little exercise in the open air. It is very common among the inhabitants of cold, moist, and changeable climates, more particularly during spring and autumn, and in variable or wet seasons; and in persons whose digestive organs are deranged, the functions of the liver torpid, and whose biliary organs and alimentary canal are loaded by morbid or accumulated secretions.

5. *B.* The *exciting causes* of catarrh are most commonly cold and moisture, or other states of the air, which either are or are not perceptible to the senses, but which impede or check the insensible cutaneous perspiration, and change the functions of those parts of the mucous surfaces most obnoxious to their first impression. That there is something in the air, often producing catarrh, beyond what is perceived by our senses, is shown by the very general or even epidemic prevalence of the affection during states of the weather and of the air, in which nothing peculiar can be observed. Its great frequency, particularly in certain localities and seasons, has induced some authors, amongst whom Dr. Macculloch is pre-eminent, to impute it to a diluted or generally diffused malaria proceeding from the usual sources of this active agent of disease.

6. Change of locality, whilst it will often remove a cold, will also frequently occasion it, especially in some constitutions; and a current of air, particularly if it come directly on the face, is a very common cause. The occurrence of catarrh on travelling and visiting places at a distance has been attributed to malaria; and this may very possibly be the case in many instances. Whenever I have gone any distance into Essex, I have returned with catarrh. It is very commonly believed by unprofessional persons, that the disease is infectious; from the circumstance of its commencing in one member of a family, and attacking others successively. This spread of the ailment, however, may be in a great measure owing to the diffusion of the same cause in the atmosphere, whether it be a much diluted or weak local malaria, or a more widely

+ There is an order or succeſsion in the parts attacked 1st the Schneiderian membrane, 2ndly the fauces & lastly the Trachea & the Bronchi: although this course is not invariably pursued we shall generally find the symptoms following this course 1st discharge from the nose with sneezing; 2ndly soreneſs in the throat with difficulty of deglutition & lastly hoarseneſs & cough, after which the disease vanishes: sometimes however it recurs to the nose or even to the Meatus Auditorius externus & is thus prolonged - changing its seat from one part to another.

+ Actual Otorrhœa is an occasionally attendant on Catarrh; the seat of the disease either changing from the Schneiderian Membrane to the lining of the External Auditory Meatus, or attacking the two conjointly, or actually making its first impreſsion on that part: in either case the cerumen disappears & is succeeded by a thin watery secretion often of a very offensive character, sometimes by a ropy tenacious secretion, having all the marks of veritable mucus:- sometimes there is considerable pain at the onset, but frequently none:- dullneſs of hearing to a greater or less extent is almost always present.

spreading epidemic influence. Still I believe that there are some grounds for the popular belief. Although these causes will explain much of what is imputed to infection; still, it may, either of itself occasion the disease, or, when superadded to them, induce an attack in those whom the states of the air, without such aid, might have spared. When catarrh is occasioned by local or generally diffused influences, it may not only thereby assume an infectious character, but really possess it; thus countenancing the opinion of Dr. CULLEN, that the epidemic prevalence of the disease only is infectious; yet, still, I question if this limitation be just. There can be no doubt, however, that when it arises from epidemic, malarial, or infectious sources, it is usually febrile and severe, and very prone to extend along the air-passages on the one hand, and to the digestive mucous surface on the other, particularly the former; while catarrh, arising from the more common causes of cold and moisture merely, in any one of the many ways in which these causes are applied to, and affect either the whole or parts only of the frame, is more commonly seated in the cephalic mucous surfaces, assuming the form of cold in the head, coryza, or sore throat, and quickly subsiding. It should not be overlooked, also, that sudden change from a low to a high temperature, or from a very dry to a very moist air; and even the being more than commonly overheated, without any very apparent chill, or exposure to cold in any form subsequently; will often produce catarrh. This is especially the case, if the exposure to warmth be sudden, after an impression of cold of some continuance, as the coming into an overheated apartment out of a cold and moist atmosphere,—the instantaneous transition from a raw air of about 32° to a dry air of upwards of 70°.

7. II. SYMPTOMS.—Owing to the circumstances already alluded to (§ 2.), catarrh manifests itself in various forms; but most commonly in the following manner: — *A. Its slighter states.* At a period generally varying from a day or two, to six or seven, but occasionally after even a shorter or longer time, from exposure to the cause, this affection commences with a sense of chilliness or coldness, lassitude, and heaviness of the head, followed by dryness, fulness or stuffing of the nasal passages, frequent sneezing, a dull pain and sense of weight in the forehead, and stiffness, or rather uneasiness, in the eyes. To these is more or less quickly added a distillation of a watery fluid from the nose and eyes, with slight redness and tumefaction of the mucous surfaces of these parts. Occasionally the above symptoms appear nearly simultaneously. The defluxion is generally somewhat acrid and saline, producing slight excoriation of the parts over which it passes. These phenomena constitute the *gravedo* of CELSUS, and the CORYZA or *defluxion* of various authors. They may be the only ailment, and not proceed further, or they may have others rapidly superadded to them, depending upon greater constitutional disturbance, and the extension of the affection to a larger surface. In the former case, the general lassitude and chilliness ushering in the complaint are often so slight as to be overlooked; but, in the latter case, and in the severer states of the disease about to be noticed, they are commonly more marked from the commencement and amount even to slight shiverings, followed by white tongue, acceleration of pulse, and increase of heat in the evening. The posterior nares and fauces, as well as the nose and eyes, are affected; and the patient complains of a sense of roughness, or soreness of the throat; loss of the sense of smell; sometimes of dulness of hearing, with soreness or pain extending along the Eustachian tube to the ear, with slight redness of the fauces and mouth, hoarseness, frequent tickling cough and efforts to excrete a mucous fluid abundantly secreted from the posterior nares, fauces, pharynx, and trachea; and sometimes with a loss or suppression of voice, from slight œdematous fulness about the glottis. To the foregoing are very commonly added, pains resembling those of rheumatism in various parts of the body, particularly about the neck, head, and limbs, loss of appetite, costive bowels, and slight thirst.

8. *B. Its severe forms.*—The above symptoms constitute the usual form of simple catarrh, which frequently subsides in from three, to seven or eight days; the fluid secreted becoming gradually less copious, more opaque and coloured, and, at last, thick, small in quantity, and yellowish white, or yellowish green; all disorder quickly disappearing. But in very many other instances, as the coryza and watering of the eyes subside, straitness, oppression, and uneasiness in the chest, supervene; with fits of coughing, and all the symptoms described under the *catarrhal* form of BRONCHITIS. In other cases, the symptoms indicate, from the beginning, a more severe affection, and a more evident constitutional disturbance, approaching more nearly to a state of inflammatory irritation of the mucous membrane of the cephalic passages, than the preceding form. In this case, the coryza and watering of the eyes are attended by much soreness and heat of the eyes, nostrils, fauces, and throat; by frequent sneezing; and by the secretion of a very copious, watery, and colourless fluid, excoriating the parts over which it passes. The fauces are red; the tonsils somewhat inflamed and enlarged; and there is a short, dry, tickling cough. The fever, which, in the slighter state of disease, was scarcely noticed, is much more evident in this, particularly towards evening; and is ushered in by chills, or shiverings, the chills often continuing throughout, and preceding the evening febrile exacerbations; catarrhal fever usually thus assuming a remittent type. The pains felt in different parts of the body, and the general lassitude, cough, anorexia, sluggishness of the bowels, and thirst, are also greater in this, than in the preceding state of the affection.

9. Throughout the disorder, the patient is unusually susceptible of the impression of cold, even although the skin be warmer than natural. He is also inordinately disposed to experience an accession of, or to contract a fresh cold, upon the slightest exposure to its causes, or even to the least depression of temperature. Owing to this circumstance, catarrhs are often very much prolonged, and either assume a chronic form, or induce chronic bronchitis, and other serious affections of the air-passages and lungs.

10. *C. Progress and terminations.*—This form of catarrh either disappears, as in the slighter states of the disorder, with a diminished and

thickened secretion, less frequent and less severe fits of coughing, and subsidence of fever, in from four, to seven or nine days; or it affects, in a much shorter period,—sometimes almost from its commencement,—the pharynx, trachea, and large bronchi, producing slight or severe bronchitis; or it terminates in this disease, or in pneumonia, or even in pleuritis. But most commonly, under proper management, it is attended merely by a moderate catarrhal affection of the trachea and bronchi; with fits of coughing, increased mucous expectoration, &c., constituting catarrhal bronchitis. It also sometimes extends down the œsophagus, and affects slightly the stomach, inducing numerous dyspeptic symptoms; and, in persons with an irritable state of the digestive tube, occasionally passing off at last with mucous or serous diarrhœa.

11. III. PROGNOSIS.—In general, catarrh is a very slight ailment, and attended with no danger as respects itself. But, in aged persons, in those disposed to pectoral diseases, particularly those who may have tubercles already formed in the lungs, who have had hæmoptysis, or who are asthmatic, or have experienced attacks of bronchitis, pneumonia, or pleuritis, catarrhal affections require strict attention, as they very often quickly produce, or terminate in, these maladies. In many persons, also, they are very prone to become chronic, either in the form of a chronic *coryza*, with continued irritation, and slight redness of the posterior nares and fauces, and an abundant muco-puriform discharge; or in some one of the states of chronic bronchitis. In the aged, and in those of a phlegmatic temperament, or lax habit of body, catarrh often passes into a chronic bronchial flux, when it has been neglected, or renewed by incautious exposures during the treatment. Children of a lymphatic and flaccid habit of body are very liable to catarrh in the form of *coryza*; and in them it very frequently assumes a chronic form; the thick muco-purulent secretion filling up the nares, and, in infants, preventing them from taking the breast, and rendering them irritable, each attempt at sucking disordering the pulmonary and cerebral circulation in such a manner as even to occasion convulsions. In children also, the *coryza*, when allowed to become chronic, sometimes degenerates into *ozæna*, with ulceration.

12. IV. COMPLICATIONS.—Catarrh very commonly ushers in the febrile exanthemata, particularly measles; and even accompanies them through their course, especially in the form of bronchitis. It is also very liable to appear during convalescence from them. Its connection with rheumatism has already been noticed (§ 3.), both disorders evidently springing from the same causes. Continued fevers, as well as some epidemic visitations of fever, are not infrequently complicated with catarrhal affections. The association of catarrh with biliary and gastric derangements is very common, sometimes in consequence of the disposition to be affected by its causes during biliary disturbance, and occasionally owing to the circumstance of simultaneous disorder of the digestive, cephalic, and respiratory mucous surfaces, having arisen from the impression of the same exciting causes. These complications have especially characterised the various occurrences of *epidemic catarrh*, which have been observed. (See art. INFLUENZA.)

13. V. The NATURE OF CATARRH is deserving of some notice. Many pathologists, particularly those of the modern Parisian school,—the followers of LAENNEC and BROUSSAIS,—consider it as ordinary inflammation of the cephalic mucous membranes, or parts of this tissue which it usually affects. Other pathologists, more especially RICHTER and HILDENBRAND, view it, with stricter propriety, as an inflammation of a specific kind. I believe, although it very often terminates in true inflammation when it extends to the bronchial tubes, that it chiefly consists of a specific irritation of that portion of the mucous surface primarily affected by it, nearly allied to inflammation, and soon followed by, or accompanied with, great increase of the secreting functions of the part; or, in other words, that it is not pure inflammation, but an irritation of a specific or peculiar kind, attended by slightly increased vascularity, afflux of the circulating fluids, and augmented secretion. Since the time that VAN HELMONT ridiculed, in his *Catarrhi Deliramenta*, the opinions then entertained respecting catarrh, enquiries into its nature have been more rational, although, up to the present time, ideas have still continued very vague as to the extent of surface affected by it, many even of modern writers comprising under catarrh, not only bronchitis, but even all affection of mucous surfaces, attended with a copious serous or sero-mucous discharge.

14. One of the most interesting questions connected with this subject, and one which has been agitated by J. P. FRANK and others, is, whether the defluxion is a consequence of the suppression of the cutaneous perspiration, arising out of the irritation which the secretion retained in the circulation produces upon the cephalic and pulmonic mucous surfaces; or of the specific irritation and morbid impression of those parts by the exciting causes of the disease. The former opinion was very generally received by the followers of the humoral pathology; and the latter by HOFFMANN, and subsequently by CULLEN, PINEL, and other disciples of his school. PINEL considered the febrile phenomena merely as symptomatic of the inflamed mucous membrane, discarding the plausible opinion advanced by BOTAL, that whatever of inflammation exists is caused by the acrimony of the catarrhal discharge, and that the local ailment is consecutive of the constitutional disturbance,—a doctrine which is in strict accordance with the description of the disease given by RICHTER, and with the more usual succession of its phenomena. In some cases, however, it is very difficult to determine the priority of the general disturbance, the local ailment being equally early. Upon the whole, I believe it is not proved that the constitutional affection is the consequence of the local, although the former is generally increased in proportion to the severity of the latter; nor does it appear that the defluxion is caused by the suppression of the cutaneous perspiration, even granting that suppression is actually produced,—a position by no means established. I would thence infer that the causes of catarrh affect primarily the organic nerves supplying the surface principally disordered, and, through them, the system generally; and that,

x To induce Perspiration is a great Desideratum in all cases, for which purpose nothing is so potent as the Warm Bath: putting the feet in very hot water is a popular remedy that acts on this principle, but is greatly inferior to a complete immersion in warm water, or the hot air Bath: The water of warm Baths should exceed 100° & the patient should remain in 20 minutes, or until faintness is induced. It may be repeated every 2nd night.

owing to this change, the secreting functions and circulating actions of the part primarily or specifically impressed, are altered, and the disease fully developed; its chief modifications arising out of the degree to which the constitutional actions are disturbed, of the extent of surface affected, and of the grade of irritation produced in the capillaries of the part.

15. VI. TREATMENT.—The treatment varies much according to the symptoms and periods of the disease. Immediately upon the approach of catarrh, before febrile exacerbation has appeared, and whilst ailment is limited to the cephalic mucous surfaces, very opposite means to those required when fever is present, or when the affection has extended to the trachea, and threatens to produce bronchitis, are generally most serviceable. Under the former circumstances, a judicious exhibition of stimulants of any kind, but especially stimulating diaphoretics, will either cut short the disorder, or render it much shorter and more mild; whilst, in the latter state, particularly when any pectoral symptoms have appeared, considerable risk will be incurred in some constitutions, although either little or none in others, of inducing inflammatory action by the same measures.

16. Early in the disease, therefore, and while a copious defluxion has not come on, the patient may inhale through the nostrils the vapour of warm water, or of any emollient and anodyne decoction or infusion: if the ailment is no more than a coryza, or cold in the head, febrile action not having appeared, he may take, upon going to bed, an active stimulating draught, consisting chiefly of ammonia, camphor, spirit. æther. nitrici, &c., with or without a narcotic. Either of the following will be used with advantage as long as febrile action, or any acute affection of the bronchi, has not appeared:—

No. 96. ℞ Spirit. Æther. Nit. ʒj.—ʒiij.; Tinct. Camphoræ Comp. ʒj.—ʒij.; Mucilag. Acaciæ ʒij.; Spirit. Anisi ʒj.—ʒij.; Liq. Ammon. Acet. ʒij.; Mist. Camphoræ ℥j.; Syrup. Tolutan. ʒj. M. Fiat Haustus, horâ somni sumendus.

No. 97. ℞ Camphoræ rasæ, gr. iij.—vj.; Ammon. Subcarbon. gr. vj.—x.; Pulv. Ipecac. gr. j.; Extr. Hyoscyami gr. vj.; Conserv. Ros. q. s. ut fiat Bolus, h. s. s.

17. The above draught will often arrest the disease, when given sufficiently early. In some cases I have directed the bolus to be taken with it, either the hyoscyamus or the tinct. camph. co. being omitted. On the following morning, a stomachic aperient may be taken; but nothing more is necessary, not even diluents, as, at this period, they will have little further effect than to increase the defluxion. When the pulse becomes accelerated, and somewhat fuller or harder than natural, with other signs of febrile action; or when the throat is more or less affected, and particularly if there be irritation about the glottis and trachea; a different practice is required. Diluents will now be of service, particularly in conjunction with emollients, diaphoretics, &c. Any of the medicines of this description in the *Appendix* (F. 238. 244.), or those denominated pectoral (F. 389. 426.), will be of service; or the following may be used. RICHTER states, that the first of these has generally been employed by him early in catarrh.

No. 98. ℞ Calomel gr. j.; Extr. Hyoscyami gr. ij.; Gum Acaciæ Pulv., Sacchari Albi, āā gr. xv. Misce et fiat Pulvis. Dispens. tales quatuor. Sumat æger tertia quaque hora unum.

No. 99. ℞ Mucilag. Acaciæ ʒj.; Mist. Camphoræ et Mist. Amygdal. Dulc. āā ℥ss.; Liquor. Ammon. Acet. ʒiij.; Tinct. Camphoræ Co., Spir. Æther. Nit., āā ʒss.; Syrup. Tolutan. ʒss. M. Fiat Haustus, quartâ vel quintâ quâque horâ capiendus.

18. Whenever we deem it requisite to act moderately on the bowels, either in the course or at the decline of the complaint, a full dose of the flour of sulphur, either with, or without cream of tartar, will be found to act most beneficially, both on the catarrh and on the abdominal functions. When febrile action becomes more fully developed, or if the disease assumes an inflammatory character, with headach, flushed countenance, or hard cough, a suitable quantity, either of the liquor antimon. tartariz., or, of the vinum ipecacuanhæ, may be added to the above draught; and either of the following given at bed-time:—

No. 100. ℞ Pulv. Ipecacuanhæ gr. ij.; Hydrarg. Submur. gr. iij.; Pulv. Opii Puri gr. j.; Mucilag. Acaciæ q. s. ut fiant Pilulæ ij.

No. 101. ℞ Pulv. Jacobi Veri gr. iij.—v.; Hydrarg. Submur. gr. iij.; Opii Puri gr. j. (vel Extr. Hyoscyami gr. v.); Syrup q. s. M. Fiant Pilulæ ij.

19. When ailment begins to subside, or when it seems likely to degenerate into a chronic state, with more or less affection of the bronchi, the treatment recommended in *Catarrhal bronchitis*, or in the slighter chronic states of the disease, should be prescribed. (See BRONCHITIS, § 69.) HUFELAND recommends a decoction of the untoasted coffee-berries, or the *carduus benedictus*, in those cases. JOERDENS advises the oleum camphoratum (F. 449.) on sugar; LENTIN, the oleum terebinthinæ rubbed on the loins; and KORTUM, camphor, with sal ammoniac. The decoction of Iceland moss, with ipecacuanha, or spiritus æther. nit. and syrup of poppies, may also be used, or either of the following:—

No. 102. Zinci Oxydi gr. j. (vel Sulphatis gr. ss.); Pulv. Ipecacuan. gr. ss.; Extract Hyoscyami (vel Conii) gr. iij.; Extr. Glycyrrh. gr. ij. Fiant Pilulæ ij. ter quaterve in die sumendæ.

No. 103. ℞ Extr. Papaveris Albi gr. iij.; Mucilag. Acaciæ ʒj.; Tinct. Camphoræ Comp. ʒss.; Spirit. Anisi ʒj.; Decocti Althææ et Aq. Sambuci āā ℥ss.; Spirit. Æther. Nit. ♏xx; Syrup. Tolutan. ʒj. M. Fiat Haustus, ter quaterve quotidiè capiendus.

20. When catarrh is connected with *biliary disorder*, or with accumulated sordes in the prima via, an ipecacuanha or antimonial emetic at the commencement of the treatment will often be of much service; especially when followed by a dose of calomel and an aperient draught, or stomachic purgative, in order to evacuate whatever morbid secretions or fæcal matters may have been collected. If it be complicated with *rheumatism*, calomel, combined with antimony and opium, and subsequently with camphor, ipecacuanha, and opium, will be found of service; biliary collections, &c. being carried off by the exhibition, every day or alternate days, of a stomachic purgative. If catarrh be accompanied with symptoms of debility, or with those of a nervous character, forming what some German pathologists have termed *nervous catarrh*, the liquor ammoniæ acetatis, with larger doses of camphor than under the preceding circumstances, or with the spirit. ammon. arom. or succinati, or the spirit. ætheris sulphur. comp., and any of the anodynes in common use, are appropriate medicines. When the disease becomes chronic, change of air is most beneficial. During the treatment, the patient should avoid exposures to atmospheric vicissitudes, and partake only of light bland diet, observing the injunctions laid down for the management of convalescence from *bronchitis*. (See BRONCHITIS and INFLUENZA.)

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CELLULAR TISSUE. SYN. *Tela cellulosa*, *Corpus cribrosum*, *Tela mucosa*, Auct. Var. *Tissu Cellulaire*, Fr. *Tissu Muqueux*, Bordeu. *Corps Cribleux*, Fouquet. *Reticular Membrane*, W. Hunter. *Filamentous Tissue*. *Cellulo-filamentous Substance*. ITS DISEASES.

ALTERATIONS OF THE. CLASSIF. SPECIAL PATHOLOGY.—*Morbid Structures.*

1. *A.* The *quantity* of the cellular tissue varies greatly in different constitutions, a large proportion of the soft solids consisting of this structure, particularly in persons of a lax fibre and rounded fleshy form. It is relatively more abundant in the female than in the male; in the young than in the aged; in the sanguine, phlegmatic, or lymphatic temperaments, than in the melancholic; and in those who are fair, than in the dark complexed and swarthy. It may be *diminished*, in parts, from pressure; or throughout the body, from disease, or inanition. Long continued and laborious exertions will also apparently lessen it; or at least diminish its bulk, by causing the absorption of the serous and fatty matters deposited in its areolæ or interstices. It is remarkably *increased* by full and rich living, and by indolence; but its bulk is then evidently, in a great measure, owing to the general fulness of its minute vessels, and to the greater proportion of fluid contained in its interstices. *Partial* increase of this tissue is also observed, but chiefly in consequence of disease. It forms, in such cases, the basis of vavarious morbid growths, particularly encysted, scrofulous, sarcomatous, and scirrhous tumours.

2. *B.* The *consistence* of the cellular tissue also varies greatly. In some persons it is unusually *lax* and *extensible;* in others, it is uncommonly *dense* and *tenacious*. The slighter changes of consistence are the result of original conformation, and of age. It is usually more lax in females than males, in the phlegmatic and lymphatic temperaments, than in the melancholic and bilious; and in very young persons, than in those of mature or advanced age. The state of vital energy also influences its consistence; for as the powers of life are reduced by disease, &c. its cohesion is proportionately lessened, and it becomes more lax and inelastic. Changes of consistence occurring in parts are chiefly the consequences of inflammatory action. Continued pressure has the effect of condensing it, and changing it from a nearly semifluid state, into a fibrous, lamellated, and firm structure.

3. *C. Inflammation* of this tissue gives rise to the most varied and important changes, according to the vital energies of the frame, the state of constitution, and habit of body, the nature of the exciting causes, and the intensity of the disease. In a previously healthy state of the system, and when the exciting cause is not of a septic or poisonous nature, the inflammation is usually of the phlogistic or phlegmonous character, and its extension is limited by the formation of coagulable lymph around the centre of the part inflamed; and which, becoming condensed with the cellular tissue exterior to it, forms a cyst for the enclosure of the purulent matter which is usually formed within the part, when the inflammation has proceeded to a certain height. (See ABSCESS, § 5.)

4. When the inflammation arises from septic or poisonous animal secretions, or from the more common causes of irritation, or of local injury acting on an unhealthy habit of body, or during unwholesome or epidemic states of the air, it assumes a *spreading* or *diffusive* character. The disease, however, may be spreading, without being primarily diffusive; for it sometimes commences in a point or circumscribed spot, as in phlegmonous inflammation; and from the influence of certain causes, hereafter to be noticed, coagulable lymph is not formed so as to limit its extent, as in that form of the disease, and it consequently spreads more or less rapidly; the part soon losing its vitality, and the secretion from the affected vessels infiltrating and contaminating the portions adjoining it, until extensive destruction and sphacelation of this tissue takes place. The inflammation may, on the other hand, owing to nearly the same causes, attack, almost coetaneously, a considerable extent of structure, and terminate either in the same way, or in a manner nearly resembling it. *Spreading* inflammation of the cellular tissue is generally the consequence of external exciting causes, particularly punctures, abrasions, wounds, fractures, &c. acting upon a predisposed system, and more commonly gives rise to a foul serous or sanious secretion, and terminates in sphacelation or gangrene; whilst *diffusive* inflammation is more usually produced by internal causes, or such as affect the nervous or constitutional powers previously to the developement of the disease in the cellular tissue; the secretion which is formed in the part approaching more nearly than that of the foregoing to a puriform matter, and extending in various directions in the course of this structure, under the integuments, &c. which it but little affects. The *former* is often connected with hospital gangrene, or is nearly allied to it, as well as to various forms of foul spreading ulceration; the *latter* is frequently an attendant upon *erysipelas*, without, however, constituting any of the states of that disease; and upon the inoculation of animal poisons, as in the dissection of bodies recently dead of diseases in which the blood and soft solids are more or less vitiated. (See CELLULAR TISSUE—*Diffusive Inflammation of*.)

5. Cellular tissue is also often the seat of *chronic inflammation*, generally in circumscribed parts, giving rise to cold or chronic abscess (see ABSCESS, § 19.); or to certain manifestations of scrofulous disease. In this state of inflammatory action, gelatinous or albuminous fluids are commonly effused into the interstices of a greater or less extent of this tissue; imparting to it a *swollen* or *hardened* appearance; as in rheumatism, gout, imperfectly cured erysipelas, pelagra, elephanti-

asis, and probably that peculiar affection denominated the induration of the cellular tissue of new-born infants. Otto comprises also phlegmasia dolens under the class of lesions of this tissue, which arises from chronic inflammation; but we have not sufficient evidence of this origin. Indeed, facts, as far as they have been ascertained regarding it, very conclusively show, that other structures besides this are affected at a very early period of the progress of this disease.

6. *D. Infiltrations*, or effusions of fluids from the circulating vessels, frequently take place in this tissue, and constitute the prominent phenomena of various diseases. *Hæmorrhage* sometimes occurs in it, either from external injuries, or from internal causes affecting the vitality of the system and the states of the capillaries and circulating fluids. When it originates in the latter source, the effused blood is usually infiltrated into the interstices of the structure in circumscribed spots, forming ecchymoses, and sugillations, as in scurvy and purpura hæmorrhagica, &c. When the hæmorrhage is extensive, it is commonly owing to the rupture of an aneurismal vessel or varix. The infiltration of serous fluids is very common, either in circumscribed parts (*œdema*), or more or less generally, although in different degrees, in the greater part or the whole of the body (*anasarca*). This preternatural increase of the serosity usually moistening the cellular tissue is owing to various causes, explained in the article Dropsy; and chiefly to increased exhalation, either from augmented determination of the circulation, or deficient tone of the exhalants, or both, — to impeded absorption, either from obstructed circulation in the veins or inactivity of the absorbents, — and to oppletion of the vascular system by the serous or watery parts of the blood, from obstructed elimination by the kidneys or by the respiratory and digestive mucous surfaces, and by the skin. A general state of very slight œdema, or an unusual fulness, softness, and flaccidity of the cellular tissue, — a condition obviously depending upon its laxity or deficient cohesion, conjoined with the presence of a greater proportion of watery fluid than in the healthy state, — not infrequently also is observed, particularly in phlegmatic and lymphatic constitutions. This has usually been termed *leucophlegmasia*; and although it may not amount to actual disease, yet it undoubtedly forms the first stage of several slowly formed maladies, and is usually attended with that state of the frame described in the article Cachexy. It is of importance to attend to the chief pathological relations of this state of the cellular tissue, as they furnish useful indications respecting the nature and treatment of various diseases with which it is often connected. It commonly proceeds from an originally weak conformation, subsequently heightened by diminished vital power of the system in general, and defective cohesion of this tissue in particular.

7. The *urinary* secretion sometimes escapes into the cellular structure, which it violently inflames; the part thus infiltrated being usually affected by the spreading form of the disease, and the constitution thereby suffering most severely, as in other cases of this state of inflammation. This tissue is sometimes also infiltrated by *aëriform fluids*, constituting the *emphysema* or *pneumatosis* of authors. This species of infiltration arises either from the escape of air into the cellular substance, owing to laceration of some part of the respiratory mucous membrane; or from a morbid secretion by the vessels in certain advanced stages of disease, as in the last period of some forms of inflammation. (See art. Emphysema.)

8. *E.* The cellular tissue is also very frequently the seat of a great variety of *morbid growths*, and formations of a specific and malignant kind. Amongst these, the most important are simple serous cysts, hydatids, tubercles, melanosis, earthy and bony concretions, the vascular sarcoma of Abernethy, &c. These adventitious productions very often commence in some part or other of this tissue, even when they are found in other structures; the matrix, or medium of connection furnished by it to other textures and organs, being most frequently their point of origin. Certain *parasitic* animals, especially the larvæ of the *œstrus*, *filariæ*, and *cysticerci*, are also occasionally met with in the cellular membrane. Changes of *colour* are not unusual, most commonly in consequence of biliary obstruction, giving rise to jaundice; and of certain malignant fevers, when it is either yellowish or yellowish green, and deficient in its vital cohesion.

Cellular Tissue—Diffusive Inflammation of the. Classif. III. Class, I. Order (*Author*).

9. Defin.—*Severe constitutional disturbance, either preceding or following intense pain and diffuse swelling of some part of the cellular tissue, with rapid pulse and depressed vital power.*

10. The parts of the cellular tissue chiefly affected, according to Mr. Hunter and Dr. Craigie, are those in which the adipose substance is most abundant. In respect, however, of its seat and nature, this important malady has been much misunderstood, owing to the circumstance of its most commonly occurring as a complication with diseases of those structures, whose anatomical connection with this tissue is extremely intimate. Dr. Duncan, to whom we are indebted for the most comprehensive account of it which has hitherto appeared, has erred in considering other maladies, thus contingently related to it, as forming varieties of it, rather than as being occasional complications with it. It is true, that, while diffusive inflammation of the cellular structure arises primarily, constituting the only or principal complaint, it is also associated (generally in a secondary form, or in consequence of the extension of inflammation from immediately adjoining tissues) with inflammations of absorbing vessels and glands, with phlebitis, with inflammation of the fasciæ, and most commonly with erysipelas; these generally proceeding from the same causes, and from similar states of constitution and vital energy of the patient, as occasion it; and one or other of these diseases often appearing simultaneously with it. But, when thus associated, it may constitute either the least, or the most remarkable part of the malady; and, therefore, in such cases at least, can only be viewed as a more or less important part of a complicated disease.

11. I. Causes.—*A.* The *predisposing causes*, as far as they are ascertained, are epidemic states of the atmosphere; impure conditions of the air originating in local sources, particularly the foul air of crowded or imperfectly ventilated hospitals and apartments; morbid accumulations of bile

in the gall bladder and ducts, and of sordes, &c. in the prima via; lowered vital power, from whatever cause; the use of unwholesome food, a cachectic habit of body, and deranged state of the digestive functions, or of the secretions.

B. The *exciting causes* are chiefly local injuries and sprains, especially punctures and abrasions; venæsection and the ligature of veins; the inoculation of various animal poisons, generally of a septic tendency; acrid substances, or vegetable or animal matters in a state of disease or *decomposition*, applied to the cellular tissue; and even the simple contact of morbid secretions and fluids with any part of the body. The numerous instances which occurred a few years since in Plymouth Dock, and described by Dr. BUTTER and Mr. TRIPE, were chiefly referrible to epidemic or endemic states of the air; were generally excited by local injury; and were complicated with erysipelas.

12. II. SYMPTOMS.—*A.* The *local symptoms* are variously modified, according to the causes by which the disease is produced. *a.* In some cases it proceeds with very severe lesion of the part to which the cause is applied, as when the fluids and secretions of a diseased animal come in contact with the skin, and give rise to the disease called "*pustule maligne*" by the French, or malignant anthrax. In this case the morbid matter produces a vesicle, from its effects on the rete mucosum, followed by a tubercle, arising from the extension of the inflammation to the true skin, whence it penetrates to the subjacent cellular tissue. Its progress then is very rapid and alarming. A considerable swelling now extends to some distance, presenting a peculiar character. The surface of the skin is shining, and the swelling is elastic, diffused, and resisting, with a throbbing pain and sense of heat, followed by a feeling of torpor, tightness, and weight of the part. This morbid state extends in all directions; and, upon examination, excites a sensation between the softness of œdema and the elasticity of emphysema, to which the terms *boggy*, or *doughy*, have been applied. The central parts generally soon become entirely deprived of life, and the mortification glides below the skin, and destroys the cellular tissue all around; the constitution being most seriously affected. A nearly similar state of the part primarily injured not infrequently follows the application of various acrid matters, animal or vegetable, directly to the cellular tissue itself. Punctures, also, which penetrate as far as this tissue, or mere abrasions of the cuticle, may also occasion it; the chief difference being in respect of the extent to which the skin is affected. In some of such cases, particularly when punctures are the cause, either with or without the application of morbid matter, the skin is very slightly diseased, although the cellular tissue is very extensively destroyed; whereas, in other instances, especially when the cuticle is abraded, or when acrid matter is applied externally to the skin, this structure is very manifestly inflamed at the same time, and the malady presents the characters of erysipelas, complicated with this affection of the cellular membrane.

13. *b.* When the disease arises from punctures, mechanical injuries, chemical irritants, and sometimes from wounds received in dissection, the constitutional disease is, as in the foregoing instances (§ 12.), preceded by the local affection. The mischief commences in the seat of injury, and extends from thence to the trunk of the body, and sometimes also in an opposite direction, without leaving any interval apparently sound. The progress of this variety differs greatly in different cases; being in some confined to the limb, or part of the limb, to which the cause is applied, and in others proceeding rapidly to the trunk, and terminating fatally. In a few of the instances following venæsection, the puncture heals as usual, and either remains permanently united, or opens again, and gives vent to some purulent matter; but more commonly union does not take place; the lips of the incision remaining slightly swollen, red, and everted. Some ichorous or puriform discharge appears, and disease extends continuously from the wound to the shoulder or breast.

14. *c.* In the most dangerous form of the malady, as that consequent upon the inoculation of a virus or morbid matter, a vesicle or pustule forms in the part to which the poison is applied, with very remarkable constitutional disturbance, followed by severe diffusive inflammation of some part of the cellular texture, generally on the same side with that on which inoculation of the disease took place, but at a distance from it, and not continuously with the primary pustule. In such cases, the manner in which the malady is propagated from the local injury, — which is most commonly in the fingers, — to the seat of the diffusive inflammation, which is usually in some part of the trunk, has not been satisfactorily shown. It has been supposed to pass along the absorbents, and, arriving at the axillary glands, to excite inflammation in them, extending to the surrounding cellular tissue; others have thought that the process takes place along the veins; but the accuracy of either of those views has not been demonstrated by dissection, both these sets of vessels having been found free from disease in cases of this description. The history of this most dangerous malady, and the nature of the cause which excites it, render it more probable that the morbid impression is made upon the organic nerves of the part, and that the frame is soon generally affected, owing to the anatomical and functional relations of this system of nerves; the intimate connection of which with the blood-vessels disposing the consecutive diffusive inflammation to appear on the same side with that on which the morbid impression was first made. The primary pustule is usually of very little extent or severity, often heals before the consecutive inflammation takes place, and is evidently the local effect of the virus upon the capillaries of the part to which it was applied. But it is quite insufficient to account for the rapid and violent constitutional disturbance which follows, and which can only be explained by referring it to the change produced by the morbid matter in the organic system of nerves primarily, and consecutively in the vascular system, and in the blood itself.

15. The chief and not infrequent illustration of this form of the disease is furnished us in the cases which follow punctures received on opening recent subjects. In the course of ten or twelve hours from the time of sustaining the injury in the finger, or not until after five or seven

days, the patient complains of rigors, remarkable debility, and frequency of pulse, with sickness at stomach, retchings, &c. A pustule appears in the part, but not always; and generally no connection can be traced between it, even when it is formed, and the diffusive inflammation which takes place during the progress of the constitutional affection. In some cases, a few red lines may be traced, or swelling of the surrounding part is observed; but neither advances any distance, the parts above being perfectly sound. In the course of the violent fever induced by the inoculation in the hand, the consecutive inflammation usually appears in the axilla, and extends towards the sternum, along the neck, down to the loins or haunch, or even to the thigh of the same side. In some instances, it terminates at the mesial line; in others, it passes continuously to the other side. It occasionally is translated from one side or part to the other, by a kind of metastasis, as in gout or erysipelas.

16. The inflammation of the cellular tissue of the trunk, whether arising from a continuous extension of the disease from the arm, or part originally affected, as in certain states of the disease (§ 12, 13.), or in the course of the constitutional commotion (§ 14.) excited by the inoculation of a morbid virus, always possesses peculiar characteristics: it is diffuse or extensive, without the smallest tendency to point; being flatly elevated above the sound parts, usually by a raised or defined margin. It is smooth and equal, without central hardness, and with all the characters already noticed (§ 12.). In general, no chords, which can be supposed to be diseased lymphatics, veins, or arteries, can be traced under the surface, and the glands are either very slightly or not at all enlarged. The diffused swelling commonly furnishes an obscure sense of fluctuation; but, frequently, when punctures have been made into it, little or no discharge has been procured.

17. The *pain* of the swollen part is most acute in every instance, whether the swelling be in an extremity, or extend along it to the trunk, or commence in the trunk itself; and it is quite independent of whatever affection of the skin may accompany the malady. In some cases, the integuments present not the least redness, although the cellular tissue has extensively suppurated, or even sphacelated; but the skin is commonly more or less affected, although in a secondary manner, in consequence of the extension of disease from the cellular tissue to it, and generally subsequently to the manifestation of acute pain. In the advanced stages, the skin has often a reddish or pink coloured blush, and occasionally a mottled or livid hue. In some cases, at a still further advanced period, solitary vesicles form over the diseased cellular tissue, and contain a serous, or sero-sanguineous, or ichorous fluid. The temperature of the part is sometimes much below natural.

18. *B.* The *febrile commotion*, whether appearing consecutively of the diffuse inflammation, directly produced in the part primarily injured, or previously to the affection of the trunk, is of a typhoid or adynamic type, and is accompanied with the most marked disorder of the nervous system, with anxious collapsed countenance, and frequency of pulse; more particularly when excited by the inoculation of a morbid matter, as by wounds from dissecting recent subjects, and when preceding the disease of the cellular tissue of the trunk. The fever sometimes commences insidiously, but more frequently in a very evident or tumultuous manner. The pulse soon becomes very quick, sharp, broad, soft, or compressible. The patient lies in the supine posture, with depressed shoulders, and without turning to either side. Delirium is common, but it is generally intermittent; and profound coma is rare. The respiration always is quick, laborious, and painful, partly owing to the inflammation of the cellular tissue of the side of the thorax, and its extension to the costal pleura. As the disease advances, the peculiar cadaverous fœtor emitted by the patient, the yellowish or lurid hue of the surface, the offensive and sometimes coloured sweat, which, in rare instances, proves critical, and the tendency to ulceration in the parts pressed by the weight of the body, show that the blood, the secretions, and the soft solids, are more or less contaminated. Towards a fatal close, the raving delirium is often accompanied with muttering, and starting of the tendons; and alternated with stupor; the breathing becoming panting, laborious, or interrupted.

19. The Terminations of the disease vary with the exciting cause, the state of the patient's constitution, and the part primarily affected. When it arises from mechanical causes, as after venæsection, simple puncture, &c., it may terminate with spreading *suppuration*, which may or may not be attended by *sloughing* of the cellular structure: and this result may occur both in cases which end fatally and in those that recover; a partial regeneration of this tissue taking place in some of the latter. In the milder cases, the inflammatory action changes its character, and shows a tendency to stop; the disease terminating in phlegmonic suppuration and granulation. If the cellular substance adjoining a serous membrane become affected, this latter participates, and the inflammation spreads rapidly over it, generally producing an effusion of sanguineous serum; but sometimes, also, adhesion of the opposite surfaces. Occasionally the adjoining periosteum becomes diseased, and even the cartilages and bones denuded. A fatal termination occurs either rapidly from the intensity of the disease, or more slowly from some one of its sequelæ: and usually takes place, in the first instance, in from four to fourteen days; in the second, not till after two or more weeks, or even longer; but the common period is from the sixth to the tenth day.

20. III. Appearances on Dissection.—Dr. Duncan has given a very minute and accurate account of the successive changes that take place in the diseased structure. As the malady often attacks progressively various parts, it is sometimes found after death, in all its stages, in the same subject. In the part last affected, which is frequently the space between the last ribs and the os ilium, the cellular substance is merely œdematous, with increased vascularity; the infiltrated fluid being either limpid or tinged with red, and readily flowing from the divided tissue. In a more advanced stage, the effused matter is less fluid, often higher coloured, but not yet puriform. The diseased structure is next found gorged with a white semifluid matter, which greatly aug-

ments its thickness, separating the particles of fat at a distance from each other, but does not flow from the incision. In a subsequent stage, this matter is opaque, whitish, or reddish, or greenish, but is now so fluid that it flows from the incision. It is still, however, contained in the cells of the tissue; and it is only in the last stage, and after the texture of the part is entirely broken down, that this puriform matter is met with in collections, mixed with portions of the sloughy tissue. At this last stage the matter is not circumscribed by any cyst, or defined cavity, but is gradually lost in the adjoining cellular substance, without any line of demarcation. (See art. Abscess, § 15.)

21. The *cellular tissue* itself is usually gray or ash coloured. It is detached extensively from the textures it connects, or adheres to them and the skin in sloughy shreds; and long sinuous cavities are found between the tendons or muscles. The *muscular structures* adjoining are generally more or less diseased, the inflammation extending to their interfibrous cellular tissue; which, however, does not appear to be alone affected, the muscular fibres having their colour altered, and being more easily torn than in health. As respects the *blood-vessels*, the number of visible red arteries is increased, and the veins are enlarged, and turgid with black blood. Mr. J. Hunter states that he found, "in all violent inflammations of the cellular membrane, whether spontaneous or the consequence of accident, that the coats of the larger veins passing through the inflamed parts became also considerably inflamed; and that their inner surfaces take on the adhesive, suppurative, and ulcerative inflammations; for in such inflammations, I have found in many places of the veins adhesion, in others matter, and in others ulceration." (*Trans. of Soc. for Improvement of Med. Knowledge*, 8vo. Lond. 1793, p. 18.)

22. The *lymphatic vessels* have not been sufficiently examined. The axillary glands have, however, been observed somewhat enlarged, and embedded in the diseased cellular tissue. Dr. Duncan states, that, although a tender and swelled axillary gland has been frequently mentioned as one of the first symptoms observed, he has never found them so much changed as at all to support the idea that their affection was the primary cause of the alteration of the surrounding parts. The state of the *fasciæ* has been very generally overlooked in dissections of fatal cases of this malady, as well, indeed, as that of the blood-vessels and lymphatics; but the fasciæ, tendinous expansions, sheaths of tendons, &c. are not always unchanged, although they appear not to have suffered in some instances. The *skin* is often severely affected, but not essentially or primarily, in the idiopathic form of diffuse inflammation of the cellular texture.

23. IV. Diagnosis and Complications. — *a.* Diffuse inflammation is readily distinguished from phlegmonous inflammation of the cellular tissue, by the circumscribed hardness of the latter, by the elevation of the tumour, and its pointing and becoming soft in the centre; and especially by the phlogistic character of the attendant fever, which will also indicate the nature of the disease, when phlegmonous inflammation is seated beneath fasciæ. In the less severe cases of the diffuse disease, particularly when it is principally seated in those parts to which the exciting cause has been directly applied, and when it has been judiciously treated in the early stages, a disposition to pass into the phlegmonous state, by the formation of coagulable lymph, and the limitation thereby put to its extension, are very generally observed. Indeed, this change of character constitutes the favourable termination of the disease; although it may also occur as a complication in unfavourable or even fatal cases, especially when veins or fasciæ are also affected.

24. *b.* Diffuse inflammation of the cellular tissue is often consequent upon erysipelas, or complicated with it, particularly the *erysipelas phlegmonodes;* the difference between them consisting in the circumstance of this tissue being primarily and mainly affected in the former; and consecutively of the inflammation of the skin, in the latter.

25. *c. Inflamed veins* may be distinguished from this disease, when they can be felt stretching like chords in the direction of the swelling, and when the pain and tenderness on pressure are chiefly limited to the same line. There is usually, also, little or no affection of the skin, even secondarily, and the disease is generally more confined to a limb; fulness of the pectoral, cervical, and lateral muscles and surface being commonly wanting. (See Veins—*Inflammation of.*) When the tumefaction is very great, it is extremely difficult to determine respecting the affection or non-affection of the veins: the consecutive inflammation of these vessels, however, and its complication with this disease, is very common, as Mr. Hunter has so accurately stated, and more recent researches have confirmed.

26. *d.* The diagnosis between this malady and *inflamed lymphatics* is also extremely difficult, owing chiefly to the same cause, namely, to the œdema and congestion of the surrounding and distal cellular tissue consequent upon the obstruction of these vessels in the inflamed state. The existence of superficial red streaks, not connected with veins, running along an extremity from the part where the exciting cause is supposed to have been applied, and swelling of the lymphatic glands to which they lead, are the only proofs we usually possess of the lymphatics being diseased; and the absence of their appearance is the chief evidence of their being unaffected. But, as in cases of inflamed veins, diffuse inflammation of the cellular substance very generally follows inflammation of the absorbents, as satisfactorily shown by Abernethy, James, Duncan, and Breschet. The difficulty of diagnosis, however, in a great proportion of cases, excepting at their commencement, must be evidently owing to the very sufficient reason of their co-existence.

27. *e.* The same circumstance also explains the difficulty sometimes found of distinguishing the disease from *inflammation of the fascia;* for in the majority of instances, the affection commences in the cellular tissue, and extends to the fascia, this latter structure being very rarely inflamed primarily, unless after it has experienced some external injury. Even when the fascia is primarily inflamed, it will not be possible, on some occasions, to form an accurate diagnosis, as disease commonly extends thence to the cellular tissue on each side of it. When the fascia is affected,

either primarily or consecutively, contraction of the limb is generally occasioned: but this is insufficient evidence of inflammation of the fascia, as inflammation and distension of the parts inclosed by it will produce this effect. When the disease commences in the cellular tissue, and extends to that portion enclosed by fascia, or to this structure itself, the skin is often unaltered even in colour. In a most severe case, attended by Mr. PARKER and myself, the whole leg and thigh, to far above the hip, were affected, and the limb contracted, and yet the skin was natural. The inflammation may, however, originate in the skin, extend to the subjacent cellular tissue, thence to the fascia, and, ultimately, to the cellular tissue beneath it; forming an important variety of erysipelas, well described by Mr. COPLAND HUTCHISON, and constituting the triple complication of diffuse inflammation of the cellular substance with that of the skin on the one side, and with that of the fascia on the other, the first being most extensively and destructively diseased. The local and constitutional suffering in such cases chiefly arise from the pressure made by the fascia upon the inflamed and tumid cellular tissue underneath it.

28. *f.* Whilst it is important to distinguish between *injury or inflammation of a nerve*, and this malady, it must not be overlooked that the one is often associated with the other; priority of affection in respect of either being the chief object of diagnosis. When, after a puncture or other local cause, very acute pain is complained of, particularly in the situation and the course of a nerve, with severe or obstinate symptoms of great nervous irritation, convulsions, &c. accompanying it, we may conclude that the disorder has originated in a nerve; and, if to those symptoms are added the diffuse, boggy swelling, &c. already described (§ 12.), we may likewise infer that diffuse inflammation has subsequently attacked the cellular tissue.

29. *g.* I have met with some instances of diffuse inflammation of the cellular tissue as a complication and termination of several severe or fatal states of disease in the *puerperal state*, both with and without affection of the skin; but only in the wards of a lying-in hospital. They have appeared in two forms: 1st, In the advanced progress of asthenic inflammation of the uterus, attended with an excoriating and fœtid discharge, which has first irritated the skin about the nates, — the cellular tissue underneath becoming diffusely inflamed to a great extent, and destroyed; and, 2d, After cases of inflammation of the uterine veins, evidently in consequence of the vitiation of the circulating fluid. Dr. OTTO, Dr. DUNCAN, and Dr. CRAIGIE, refer phlegmasia dolens to diffuse inflammation of the cellular substance. But, I think, on insufficient evidence. If this tissue be really inflamed in that disease, other structures participate; and it certainly is not the part first affected. In the cases which I have seen examined after death, — only three in all, — the nerves and veins were the parts to which the symptoms of disorder were first referred; the veins being obstructed in all the cases. (See PHLEGMASIA DOLENS.)

30. *h.* The cellular tissue of the side of the neck and throat is sometimes diffusely inflamed, apparently from an extension of disease, in angina maligna, and worst form of scarlet fever, the patient sinking from it rapidly. I have, however, met with one case of this description, where recovery ultimately took place. This disease also rarely occurs near the anus, or about the buttock and perinæum, in the course of fevers, dysentery, &c. But it is more disposed, on these occasions, to limit itself, and to terminate in suppurating abscesses. When it occurs in aged persons, from the escape of urine into this tissue, it generally extends rapidly and terminates fatally; and a nearly similar result follows its appearance after important surgical operations, as after lithotomy, amputations, and the ligatures of veins and arteries for aneurismal dilatations of them.

31. V. PATHOLOGICAL INFERENCES. — *a.* Conformably with recently accumulated facts connected with diffusive inflammation of the cellular tissue, it may be concluded that it presents various morbid associations and grades of intensity, as well as distinct relations to the attendant constitutional disturbance, according to the diversified causes which occasion it: — 1st, That depressed vital power, or a previously disordered state of the chylopoietic viscera, or general cachexy, is often requisite to its occurrence: 2d, That abrasions, the irritation of acrid secretions or decomposed animal or vegetable matter, simple punctures, injuries received during the dissection of subjects in a state of incipient decay, and the contact of morbid fluids, most commonly produce the disease primarily in the part in which the injury is sustained, the mischief spreading continuously from thence; although occasionally appearing afterwards in other parts, without any continuous connection, when the circulation has become contaminated by the primary affection: 3d, That, when originating and spreading as now stated, sometimes the skin, at other times the veins, occasionally the lymphatics, on some occasions the thecæ or fasciæ, and more rarely the voluntary nerves, or any two or more of these, participate more or less in the disease: 4th, There appear to be other causes, which, acting in the manner of specific poisons, produce comparatively but little effect on the part to which they are directly applied; but which affect the system universally, chiefly by depressing and otherwise changing the organic, nervous, and circulating functions, the alteration of the cellular tissue appearing subsequently: 5th, That the local affection in this form of disease, which may be denominated consecutive diffusive inflammation of the cellular tissue, is often of very small extent compared with the severity of the constitutional disturbance; and, very frequently, appearances of contamination of the frame present themselves before the cellular tissue is affected, and even then the affection may be trifling, or even not recognisable (see POISONS — *Animal.*): 6th, That the malady originating in the inoculation of a poison or virus, particularly during the examination of recently dead bodies, cannot be ascribed to inflammation of veins, or of lymphatics, or of nerves, or of fasciæ, or even of the cellular tissue itself; and that, although this last most frequently exhibits morbid appearances, yet are these appearances obviously contingent upon general disease of the frame, interesting in a special manner its various vital manifestations. (See *Author*, in *Lond. Med. Repos.* vol. xx. p. 24. 1823.)

32. *b.* As respects the *association of the local and constitutional affection*, all the cases of this disease may be divided into two classes: — 1st, Those in which the constitutional disturbance is mainly owing to the primary local lesion, or its extension, whether it be inflammation of the cellular tissue alone, or of this tissue associated with inflammation either of veins, lymphatics, thecæ, aponeuroses, or of the skin; the relation subsisting between the intensity of the primary local affection, and the constitutional disorder, being more or less apparent and co-ordinate (§ 12, 13.): 2d, Those in which the local lesion is obviously the least important change that has been induced, either directly by the exciting cause, or consecutively by the constitutional affection; and, even when it becomes the most serious, is manifestly the result of the constitutional affection (§ 14.), and disproportioned to it. Thus the local and the general symptoms are presented to us in a different order in these two forms of the disease. In the *first*, also, the febrile action is more inflammatory than in the second, but still partaking of the irritative character, as has been very justly insisted upon by Mr. Travers. In the *second*, it is more asthenic; the nervous system is much more disordered; the anxiety, distress, and mental and physical depression, are greater than in the first; and all the organic functions more gravely affected; the blood, the secretions, and soft solids, becoming at last very evidently altered.* (See Blood, § 139. *et seq.*)

33. VI. Prognosis.—The danger of this disease is much less when it is accompanied with inflammatory, than with adynamic or highly irritative fever, and morbidly excited sensibility. In general, the rapid extension of the disease from the arm to the trunk; great tumefaction of the region of the pectoral muscles; the first appearance of the inflammation in this situation, or in any part of the trunk, from causes which first occasioned serious constitutional disturbance; remarkable frequency of pulse following rigors, with anxious collapsed countenance, ferrety eyes, delirium, difficult respiration, depression of mind, the accession of fresh rigors, extreme debility, and stupor; are all indications of great danger. The nature of the cause, also, should influence the prognosis. When it proceeds from the ligature of a vein, venæsection, and particularly from wounds in dissecting recent subjects, the danger is great. There is, however, less risk when the disease arises in the part to which the cause has been applied, and when the skin becomes much affected with a disposition of the inflammation to limit itself, and form healthy pus, than when it appears consecutively of a pustule merely in the part inoculated, and of fever with extreme depression.

32. VII. Treatment.—*A. Prophylaxis.* Precautions are absolutely requisite when punctures are received in *post mortem* examinations, or when the cuticle about the nails and hands of the examiner is abraded. Some constitutions are more liable to be inoculated in this way than others, particularly persons who are out of health at the time, or whose vital energies are depressed. Wearing gloves during a morbid dissection may be of use in such circumstances. Dr. Duncan suggests the anointing of the hands with camphorated oil, or with simple axunge, before handling the viscera. Abrasions about the fingers should be protected by adhesive plaster. If, notwithstanding, punctures are received, or if an abraded or punctured part come in contact with any of the fluids or soft solids of a recently dead body, with animal or vegetable matter in a state of decomposition, with acrid or morbid secretions, suction or perfect ablution of the part ought instantly to be performed; a pledget of lint, wet with either a strong solution, or the oil, of camphor (F. 449.), or with turpentine, applied to it, and the application covered so as to prevent its quick evaporation. On the several occasions of the employment of these means, in the persons both of myself and of my medical friends, no disturbance has accrued from these accidents. Two partial exceptions, however, have occurred, but in such a way as to confirm the propriety of this practice, and illustrate the nature of one form of the disease. The punctures, in these two cases, were received when examining the bodies of females who had, but a few hours previously, died of malignant puerperal fever; and the application was not resorted to until after leaving the apartment where the inspection was made. In one of those cases, — that of a pupil, — camphor was used; in the other, — that of my friend, Mr. Churchill, — ammonia was employed. Both these gentlemen experienced, within twenty-four hours afterwards, considerable general disturbance, with sickness at the stomach, and nervous depression and debility. All disorder, however, disappeared in a day or two after the exhibition of warm diaphoretics and stimulants; but in neither case was the least irritation observed in the part punctured. The morbid impression was evidently made upon the organic nervous system, as evinced by disorder of the functions more immediately dependent on it; but was not so intense, relatively to the state of predisposition, as to occasion further disease. As to the use of ligatures, &c., I must refer the reader to what I have stated respecting them in the article on *Animal* Poisons.

35. *B. Curative treatment.* — *a.* It will be evident, from the history of diffusive inflammation of the cellular tissue, that *local means* are chiefly applicable to certain of its states and complications. When the primary local affection is attended by much pain, both cold and warm applications have been recommended by different writers. The choice, however, between them, may be determined by the sensations of the patient: but warm fomentations, unremittingly employed, appear to me the safest, particularly when inflam-

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* It may be stated at this place, that the disease which has been observed to follow inoculation of an animal poison during the examination of recent subjects is obviously distinct from diffuse inflammation of the cellular tissue, although this local affection, or some modification of it, often takes place in the advanced stage of that disease, which has accordingly been referred to in this article as one of the chief causes of the lesion now under consideration. The subject is, however, considered more fully in the article on Poisons. In justice to myself, I should state, that I published, in the *London Medical Repository for July*, 1823, p. 24—27., some remarks on the nature of the malady infected by inoculation from recent subjects, and the operation of animal poisons on the economy; and I request the favour of the reader who is interested in these important subjects to refer to these remarks, and to the conclusions, to which Mr. Travers has come, in his work on Constitutional Irritation, p. 413. Lond. 1826.

mation is externally apparent. When the local affection is limited chiefly to the part to which the cause was applied, or its vicinity, the detraction of blood from it by *leeches* or *scarifications*, and *incisions* through the integuments, ought not to be neglected. The latter of these two modes of local evacuation, as first recommended by Mr. COPLAND HUTCHISON, is evidently the most beneficial, not merely by procuring a more decided and rapid discharge, but also by giving an external outlet to the matter which otherwise would infiltrate the cellular tissue, and extend the mischief. Even in cases of great vital depression, and when the cellular tissue is consecutively diseased, incisions should not be neglected; they being compatible equally with an energetic, tonic, or stimulating treatment, as with its opposite: and they are not the less necessary in the early stages than at later periods, and when fluid is diffused through the cellular structure. When the part affected is deeply seated, they should be deep and large, so as fully to reach it; their number being proportionately diminished. But the great object is to make a free passage for whatever fluid matter may have formed, or that will form subsequently. This practice has received the approbation of Dr. DUNCAN, and the best recent writers on this disease; and its propriety has satisfactorily been shown in those cases which have fallen under my own observation.

34. *b.* The *general means of cure* are usually directed with the intention of subduing the local affection, and more especially the state of high nervous sensibility and vascular irritability which exists, whether this state be consequent upon the primary lesion produced by the exciting cause, or whether it be the immediate effect of that cause, and the antecedent of any affection of the cellular tissue, as in cases of inoculation by morbid matters or animal poisons. But, although this intention is generally kept in view, very different, and even opposite, measures have been recommended for fulfilling it. It is evident that the same measures are not suitable to all states and periods of the disease; and possibly to this cause may be imputed the great diversity of means which have been advised, and the partial success attributed to very opposite methods. Much also is owing, more generally than has been admitted, to the constitutional powers of the patient. A number of practitioners and writers advocate general blood-letting, and trust chiefly to it for the fulfilment of the above intentions, without adverting to the fact, that the morbid states forming the essential characters of the disease are, in their severest and most deadly forms, independent of sthenic action, and cannot be either limited or subdued by venæsection, although it may be required to a moderate extent; particularly when the local affection arises primarily and directly from the exciting cause, implicates any of the parts which I have noticed as being involved in its complicated forms, and is chiefly antecedent of the grave constitutional disturbance characterising the advanced stages of disease. But even in such cases, the depletion should be practised early, and confined chiefly to young, plethoric, or robust persons; the local evacuation consequent upon free incisions being sufficient in most cases. In other respects, the treatment in this form of the disease may be similar to that recommended in inflammation of the veins; for the principle acted upon by Mr. JOHN HUNTER in respect of that malady, and which is founded in accurate observation, is equally applicable to this — namely, to impart energy to the system, so as to enable the vessels to form coagulable lymph, by which the extension of the morbid action may be limited, and a diffusive or spreading inflammation may be converted into the phlegmonous state. This practice is still more imperatively required in the other form of the disease, or that in which the affection of the cellular tissue is consecutive of a constitutional disturbance, excited by a morbid virus or animal poison.

35. The frequent inefficacy of depletions and the antiphlogistic treatment, and even their injurious effects, as shown by the rapid sinking consequent upon them, are fully demonstrated by the history, given by Dr. BUTTER, of the disease which occurred in Plymouth Dock, and by the cases after wounds in dissection recorded by various writers. The instances of recovery after this practice cannot be brought as evidence of its efficacy; inasmuch as the smallness of their number; the tonic treatment, which, in several of them, followed vascular depletions; and constitutional energy; may be adduced to disprove it. After studying the cases which have been published by Dr. DUNCAN, Dr. COLLES, Mr. TRAVERS, Dr. DEASE, Dr. BUTTER, &c., and reflecting on my own limited experience, I would strenuously recommend the following measures, in addition to those already advised: — As to the question of blood-letting, that is already disposed of; but I may further add respecting it, that, however great the severity of the pain, or the sensorial excitement; or however frequent, open, sharp, or bounding the pulse; these symptoms should be arguments against, rather than in favour of venæsection. But if the pulse be not remarkably frequent, or if it be firm and constricted, then this operation ought to be performed. Yet I should expect little or no advantage from this practice, in those cases of the disease which proceed from the inoculation of putrid or morbid animal matters or poisons, whatever the character of the pulse may be. It is, however, seldom such as can warrant depletion in these cases; being generally of the former description, and rarely of the latter. The object which we should propose to accomplish, next to that already stated, is to rouse and support the energies of life, and thus to oppose to the extension of the disease an augmented vital resistance. This can be done only by a stimulating and tonic treatment, and by the expulsion from the frame of such impurities and morbid matters as may tend to impede the natural functions, and depress their energies. The means which we should employ with these views, if judiciously selected, will be more efficacious than any other for the fulfilment of the intention proposed above (§ 34.). The agents which I have found most successful in attaining them, are large doses of camphor, with opium, sometimes also with calomel, and the occasional exhibition of spirits of turpentine, either alone or with castor oil, and of one of the enemata (F. 148, 149.) contained in the Appendix. The plan I have followed in several cases of this disease, mostly of a more or less complicated

nature, which I have treated, has been to give the following bolus, or the pills first prescribed; and a few hours afterwards the draught, which, in three or four hours, should be followed by an enema (F. 151.): —

No. 104. ℞ Camphoræ rasæ gr. x.—xv.; Hydrarg. Submur. gr. x.—xx.; Opii Puri gr. jss.—ij.; Pulv. Capsici gr. iv.; Conserv. Rosar. q. s. ut fiat Bolus, statim sumendus, et horas post tres vel quatuor repetendus.

No. 105. ℞ Camphoræ rasæ gr. vij.—xij.; Ammon. Carbon. gr. xv.; Hydrarg. Submur. gr. xx.; Pulv. Capsici Annui gr. viij.; Opii Puri gr. iij.; Mucilag. Acaciæ q. s. ut fiant Pilulæ xij., quarum capiat binas omni horâ vel bihorio.

No. 106. ℞ Olei Terebinthinæ ℥ss.—℥j. (vel etiam Olei Ricini ℥ss.); Olei Cajeputæ ♏ vj.; Lactis Recentis ℥ij. Fiat Haustus.

36. If a free evacuation of the bowels be procured, the bolus and draught should not be repeated more than once; if the evacuation be scanty, they may be given a third time, having prolonged the period between the second and third doses; in the intervals between which, as well as subsequently, the following pills and draughts may be taken: —

No. 107. ℞ Camphoræ rasæ gr. iij.—v.; Ammon. Carbon. gr. iv.; Pulv. Capsici gr. j.; Mucilag. Acaciæ q. s. M. Fiant Pilulæ ij., secundâ, tertiâ, vel quartâ quâque horâ sumendæ, cum Haustu sequente.

No. 108. ℞ Mist. Camphoræ ℥j.; Liq. Ammon. Acet. ʒjss.; Spirit. Æther. Sulphurici Comp. ʒj.; Tinct. Capsici Annui ♏ x.; Syrup. Aurantii ʒss. M. Fiat Haustus, cum Pil. supra prescriptæ capiendus; vel

No. 109. ℞ Infus. Cinchonæ ℥j.; Liq. Ammon. Acet. ʒij.; Spirit. Ammon. Arom. ʒss.; Tinct. Capsici ♏ xij.; Olei Cajeputæ ♏ vj. M. Fiat Haustus, ut supra sumendus.

37. In the slighter cases, less active means will be found sufficient; but when the disease assumes a serious form, and particularly if the constitutional symptoms manifest themselves before the affection of the cellular tissue has commenced or made any sensible progress, the above or similarly active remedies must be energetically prescribed.

38. During the course of the more adynamic states of the malady, after alvine evacuations have been procured, I have seen the best effects follow the liberal use of wine, and large doses of bark with the aromatic spices. If the tongue and mouth be parched, the pills or bolus, and the turpentine draught, prescribed above, should precede the exhibition of the wine, bark, or sulphate of quinine. The irritability of the stomach and delirium, often accompanying the advanced stage of the worst states of the disease, being more readily allayed by powerful stimuli, as camphor, capsicum, ammonia, ether, spirits of turpentine, cajeput and other essential oils, wine, bark, sulphate of quinine, brisk bottled ale and stout, very small doses of opium, brandy, &c., than by medicines of any other description, it will be necessary to administer these, in forms of combination suited to the circumstances of the case; chiefly with the view of rousing and supporting the energies of life, changing the state of morbid action, and thereby preventing the extension of the local mischief, and the tendency to contamination of the fluids and solids of the frame. The regimen during the treatment should be in accordance with these intentions, and the patient should be allowed what he may crave for; as desire in such cases for articles of food, or for particular beverages, is the instinctive expression of the wants of the economy.

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Cellular Tissue — Induration of.

Syn. *Œdematie concrète*, Billard. *Sclérème*, Chaussier. *Squirrho-Sarque*, Beaumes. *Skin-bound*.

Classif. III. Class, I. Order (*Author*).

1. Defin. *A wax-like consistence of the skin and sub-cutaneous cellular tissue, commencing in the hands, face, and lower extremities — the parts most remote from the centre of the circulation; often extending to the trunk, the parts being cold, often pale, yellowish, or rose-coloured, frequently mottled, or livid, with weak pulse and respiration, terminating in congestion of the lungs and asphyxy.*

2. This affection was first described, in 1718, by J. A. Uzembezius, physician to the hospital at Ulm, and afterwards more fully investigated by Doublet, Andry, Auvity, Hulme, Denman, and Underwood, as well as by several contemporary writers. It is very prevalent and fatal in some of the lying-in and foundling hospitals on the Continent, but is comparatively rare in this country, especially during recent times. Its nature and seat have been much discussed by foreign medical writers; and even at present, various points connected with its pathology are not fully established. It is, however, evident that the disease assumes various forms, and exhibits different morbid relations, which may be referred to the two following varieties.

Var. i. *Œdematous Hardening of the Cellular Tissue; Sclérème œdemateux*, Chaussier and Dugés.

3. In this form of the disease, the sub-cutaneous cellular tissue is infiltrated with a yellowish coagulable albuminous serum; the limbs of the infant are more or less tumefied as well as hard, are somewhat rigid, and the skin assumes a violet tint, owing to the pulmonary congestion accompanying it; with weak oppressed respiration, and feeble irregular pulse. In some cases, it commences with simple œdema, particularly when it arises from exposure to cold. If the cold have acted upon the greater part or whole of the surface of the body, the affection is sometimes more or less universal, but usually most remarkable in the limbs. It rarely attacks the abdomen, chest, and neck. The parts diseased are cold, tumid, discoloured, insensible, hard, and receiving and preserving the impression of the finger when very firmly applied. During the progress of the affection, the cry becomes very weak and peculiar, dyspnœa increases; the thorax is dull on percussion; and the impulse of the heart, and the respiratory murmur, are found weak on ausculta-

tion. Death often follows in from four to eight days, without any convulsion, but generally preceded by a lethargic somnolency; and spasmodic attacks resembling slight trismus, and opisthotonos sometimes occur in the advanced stage. The indurated parts occasionally assume an erysipelatous appearance, and, in rare instances, pass into sphacelation. In favourable cases, or after an early and judicious treatment, the affection subsides; the hardness, and afterwards the œdema, disappearing in the course of two or three weeks. M. Gardien states, that he observed suppuration of the affected part to occur in one case only.

Var. ii. *Induration affecting chiefly the Adipose Tissue; Sclérême concret*, Chaussier, Dugés; *Skin-bound*, of English authors.

4. This variety generally depends upon the sudden impression of severe cold; is comparatively rare, and is chiefly met with in lying-in and foundling hospitals. The cheeks, limbs, fore-arms, thighs, back, abdomen, chest, and neck, successively, or two or more of them simultaneously, assume a remarkable hardness, which yields not to the pressure of the finger. The temperature and sensibility of the surface are much depressed; and with difficulty raised. The skin is pale or yellowish, and wax-like; sometimes livid or mottled. Trismus and opisthotonos are more common in this, than in the preceding variety. There is little or no tumefaction or œdema; the skin being fixed and immoveable upon the subjacent parts. In some instances, the extremities and back are somewhat emaciated, dry, and even rigid, particularly in the advanced stage; and the cheeks and temples are collapsed. At the commencement, the appetite and digestion are often not much affected; but during the progress, and towards the close of the disease, the bowels become more or less disordered. Dr. Denman and Dr. Underwood seldom met with it but accompanied with some bowel complaint. The infant soon becomes too feeble to draw the breast; it utters a peculiar moaning noise, or feeble whining cry; and has the appearance, even early in the complaint, of dying; and, at last, sinks apparently asphyxied. In favourable cases, the skin and extremities lose their hardness and rigidity, and the infant recovers gradually, if pulmonic inflammation does not come on, and carry it off. Inflammation of the indurated parts seldom or never appears in the course of this variety.

5. Pathology. — M. Gardien states, that he has sometimes remarked a slight increase of heat precede the insensibility, coldness, and hardness of the parts affected; but without any general febrile symptoms. The only indications of disorder he has observed to usher in either variety, are difficulty of respiration, and a peculiar feebleness of the pulse and of the voice. Somnolency or lethargy is very usual during the course of the disease, and, as M. Doublet observes, increases towards a fatal termination. The affection, particularly the latter variety, is rarely congenital. M. Duparcque has detailed two cases in which the infant upon delivery was so hard and rigid as to resemble a mummy, the vessels of the umbilical chord being diseased.

6. *A. Causes.* — The different states of this disease have been attributed to a syphilitic taint. It is, however, most commonly owing to the influence of cold upon new-born infants, and generally occurs from the second to the fourteenth day from birth. Imperfect or unwholesome nourishment, and the influence of a vitiated atmosphere, particularly the air of crowded hospitals, upon the imperfectly developed respiratory functions, are, in my opinion, amongst its most energetic causes. It is very apt to occur in prematurely born infants, in those of a feeble constitution, and who are deprived of the mother's or nurse's milk. M. Palletta remarks, that out of sixty-five cases, forty were prematurely born. M. Ratier states, that its dependence upon atmospheric cold is shown by the greater number of cases at the *Hospice des Enfans Trouvés*, when winter sets in. But as a free ventilation, and dissipation of the foul air of an hospital ward, are in some measure prevented during cold weather, the prevalence of the disease at this season may be equally owing to this circumstance. M. Billard has shown that the number of cases in the warm months is usually not much less than in the cold, in the above-named hospital. Dr. Bigeschi, however, states a fact, in his report of the Lying-in Hospital at Florence, which shows the great influence of cold in causing this affection. He observed the disease very prevalent during the winter season, especially if rigorous; and he consequently ordered the infant to be kept in the mother's bed, as warm as possible; and from that time no case of it occurred. M. Souville has met with the disease frequently in the northern departments of France, and also attributes it chiefly to cold, the influence of which is likewise admitted by Palletta. It sometimes, also, occurs in the course of the bowel complaints incidental to infants, particularly when improperly nourished; and it is frequently complicated with the jaundice of this epoch. M. Billard states that, in seventy-seven cases with œdematous induration, thirty were jaundiced.

7. *B. Appearances in fatal cases.* — In the first or most common variety, the cellular tissue is found loaded by a thick albuminous serum, which coagulates by heat, and which, according to M. Leger and M. Billard, partly escapes upon dividing it. Dr. Palletta, however, states that, upon division, it remains firm and concrete, the infiltrated matter not escaping. In the second or more rare form of the affection, the cellular and adipose tissues are hard, concrete, and frequently of a deep yellow colour. The adipose tissue often presents a number of small dark yellow grains dispersed through it. The lymphatic glands, as well as the mesenteric glands, are enlarged; and slight serous or sero-albuminous deposition into the cellular tissue is observed throughout the body, with sanguineous or sero-sanguineous infiltration of parts of it; and effusion into the shut cavities. The vessels of the brain are usually congested. The cavities of the heart are loaded with blood; the foramen ovale is sometimes more open than it should be; the pericardium contains some sanguineous serum; the lungs are often congested or hepatised; and the larynx and epiglottis œdematous. The liver is frequently large and congested; the gall-bladder and hepatic ducts full of bile; and the gastro-intestinal mucous surface more or less inflamed. The most constant morbid appearances are the engorgement of the venous system; the dark or black state of

the blood; the accumulation of a thick, deep-coloured, viscid, or coagulated fluid in the adipose and cellular tissues, imparting to them a condensed or firm appearance; and the congestion of the thoracic viscera: but these latter are commonly not otherwise diseased.

8. *C. Proximate Cause.* — The first variety of this affection may be considered as a form of œdema; the peculiarity resulting chiefly from the thick, coagulable nature of the effused fluid, and the deficient developement of animal heat in parts far removed from the centre of the circulation; in consequence of which the adipose matter either is secreted in a morbid state, or cannot be preserved in its natural semifluidity. The second or more rare form of the affection is chiefly to be attributed to this change of the adipose substance, which, owing to defective vital manifestation in the part, and the depressed grade of animal warmth, assumes the condition which it usually presents soon after death. M. Denis supposes that the disease is connected with the gastro-intestinal irritation so frequently found upon dissection. Dr. Hulme and, more recently, Dr. Palletta viewed it as consecutive of, and occasioned by, the congestion of the lungs and the difficulty of the pulmonary circulation; whilst M. Baron, physician to the Parisian Hospital, in which from two to three hundred cases occur every year, considers that the internal congestion takes place subsequently to the appearance of the disease. I believe that this is the more correct view; for M. Billard found unusual congestion or hepatisation of the lungs in less than one half the cases he examined. There can be no doubt, however, that as the affection of the cellular tissue proceeds, and as the circulation in this tissue and in the extremities is more and more retarded, congestion of the internal viscera comes on; but not always in the same organ; the encephalon, cavities of the heart, liver, and spleen, also experiencing this change; sometimes with serous or sero-sanguineous effusion into the adjoining shut cavities. The frequent complication of the disease with jaundice would seem to indicate that the biliary organs are more or less affected; and such may be the case in respect of their functions: but M. Billard found, in ninety cases, twenty only of organic lesion of the liver, the icteric appearance being evidently dependent upon the morbid state of the serum of the blood, and the deficient vital endowment of the cutaneous capillaries. M. Breschet had found the foramen ovale more than commonly open in many cases, and inferred that the affection was caused by this circumstance. M. Billard states, that his numerous examinations do not countenance this inference, but admits that they are often coincident changes. This writer, who has paid much attention to the subject, concludes, that general debility, congenital plethora of the vascular system, congestion of venous blood in the tissues, and unusual dryness of the skin previous to the exfoliation of the epidermis, are its chief predisposing causes; and that vascular plenitude, an engorged state of the cellular and adipose tissues, and the influence of external agents interrupting cutaneous transpiration, are its more immediate causes; the coldness of the extremities and affected parts resulting from the slowness of the circulation and the depression of the vital powers.

9. Diagnosis and Prognosis. — *A.* This affection is obviously more or less intimately related to œdema on the one hand; and, in some instances, to erysipelas on the other: — to the former, by the effusion of fluid in the cellular tissue; but differing from it chiefly in the persistent, firm, wax-like, and coagulated state of the infiltrated part, and in the reddish yellow, livid, or mottled appearance of the skin; — to the latter, by its frequently dark red, or livid colour; but differing still more widely from it, in the principal affection of the cellular tissue, in the remarkable coldness of the part, languor of the circulation, and general absence of any change in the skin itself. And it is distinguishable from both, by the peculiar cry of the infant; the weak, moaning, and sibilant respiration, the dyspnœa, the feeble irregular action of the heart; the leipothymia and lethargy, and the frequent complication with trismus and tetanic spasm; as well as with the peculiar jaundice of infants. It may be also mistaken for *erythema nodosum;* but the knotted sensation, upon passing the fingers over the skin, furnished by this affection, is sufficient, of itself, to distinguish it from the smooth, cold, and diffused hardness of the present disease.

10. *B.* The *Prognosis* should be always reserved or cautious. A large proportion of those attacked die, particularly in hospitals, even under the most judicious management; sometimes, in two, three, or four days, in the most severe cases, and in prematurely born children that have been exposed, soon after birth, to cold. But, generally, the disease does not terminate either way in less than from six or eight days to twenty or thirty. It may even be more prolonged; and when recovery is advancing, inflammation of the lungs or digestive canal, or effusion on the brain, may occur, and either cut off the patient, or put his life in the utmost jeopardy.

11. Treatment. — The intentions of cure will vary with the particular form of the disease. In the *first*, or œdematous variety, in which vascular plethora is generally present, depletion is often of service; particularly if the circulation in the extremities and affected part be at the same time excited by means of frictions with warm stimulating liniments. MM. Baron and Billard prefer frictions to the use of the vapour bath, recommended by MM. Dugés, Péligot, and others. In the *second* variety, in which there is less œdema, and greater induration, and, according to several recent writers, a coagulated state of both the adipose substance and the fluid effused into the cellular tissue, blood-letting may not be admissible. MM. Chambon, Palletta, and Gardien, however, consider that, in this variety also, depletion should be practised, in order to relieve the cerebral congestion attending it; and therefore recommend two small leeches to be applied behind the ears. In this practice I have generally concurred, but have adopted it with much caution in prematurely born or weakly infants; directing, also, for all the states of the disease, calomel or hydrarg. cum creta, with soda, and small doses of ammonia; the compound decoction of sarsaparilla with liquor potassæ; the warm bath, followed by repeated frictions of the surface with stimulating

liniments; and the nourishment Nature intended for the infant. Although a very common and fatal disease in France, it is seldom observed in this country; and even at the Infirmary for Children, cases of it have very rarely presented themselves. I have not met with an instance of it in the Queen's Lying-in Hospital.

12. After the above means have been persevered in for a time, a few drops of spirits of turpentine and sweet spirits of nitre may be given occasionally in sugared dill-water; and the infant enveloped in very soft flannel or wash-leather, which ought to be covered over with oiled silk, in order to prevent the dissipation of the animal heat. Dr. Palletta states that he treated, with uncommon success, the very numerous cases that occurred in the Lying-in Hospital at Milan, with half a grain of the *kermes mineral* (F. 637.) given three or four times a day, and warm bran or warm flour applied to the parts affected. Andry and Gardien advise the use of blisters; — the former to the affected parts; the latter to the nape of the neck, with the view of preventing the occurrence of cerebral congestion; — but I have had no experience of their use in this disease; and consider them less efficacious than frictions with stimulating liniments, several formulæ for which are given in the Appendix. During treatment, a pure warm air, and the natural food of the infant, furnished by a healthy nurse, will be found extremely conducive to recovery.

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CEPHALITIS. See Brain, *Inflammation of*.

CHEST. Syn. *Thorax*, Fr. *Der Brustkasten*, Ger. *Torace*, Ital. *The Thorax*.

External Examination of, in the course of Disease. — Classif. General Pathology — *Semeiology*.

1. *Regions of the Chest.* — It is necessary to divide the chest into different regions, in order to give precision to our diagnostic researches. This is done by drawing horizontal and vertical lines from certain conspicuous parts of the body. The first horizontal or transverse line extends anteriorly from the humoral extremities of each clavicle, across the junction of the clavicles with the upper part of the sternum, posteriorly passing over the last cervical vertebræ; the second, around the middle of the chest, anteriorly passing over the nipples, and posteriorly passing between the spine of the scapulæ and their inferior margins; the third passes around the lowest part of the chest, from the zyphoid cartilage, and over the hypochondria. The first vertical line extends from the upper to the lower extremity of the sternum; the second and third, from each acromial extremity of the clavicles to the external rami of the pubes; the fourth and fifth, from each posterior margin of the axillæ to the crests of the ilia; the sixth and seventh, from the clavicular transverse line along the posterior border of each scapula, or a little exterior to it, to the middle horizontal line; and the eighth, along the spinous processes of the dorsal and cervical processes. To these lines may be added one drawn on each side, from the last cervical vertebra, around the lower part of the neck, and sloping downwards to the upper part of the sternum. Thus the chest will be divided into sixteen regions, viz. *two superior*, or humoral regions; *four anterior*, — the subclavian and submammary; *four lateral*, — the axillary and subaxillary; and *six posterior*, — the scapular, subscapular, and interscapular.

2. The viscera lodged beneath each of the different regions of the chest, and the nature of its parietes, are too well known to require any notice. I therefore proceed to point out the various methods which are employed to investigate the diseases of the thoracic organs. These consist of *inspection*, *mensuration* and *manual examination*, *percussion*, *succussion*, and *auscultation*.

3. *A. Inspection.* — It is important for the physician to take into consideration the *form* and *size* of the chest, in estimating the causes, nature, and tendencies of disease. Vigour of constitution is generally incompatible with a small or ill formed thorax; this conformation not only disposing to various affections of the viscera contained in this cavity, but also aggravating their severity. Every change from the due proportions of the chest ought to be considered of importance. This cavity is generally artificially modified in its form in females. Its capacity is reduced in a transverse direction, by the lateral compression to which it is subjected; and, owing to the same cause, the superior abdominal viscera are pushed upwards, and it is thereby further diminished in a vertical direction. But the compression thus exercised not only reduces the absolute capacity of the chest, but it also prevents the elevation of the ribs, and the descent of the diaphragm during respiration, rendering each inspiration of small amount, and insufficient for the developement and wants of the frame. It moreover presses the lower ribs downwards and inwards upon the more important viscera contained in the abdomen; prevents the ascent of the contents of the cæcum; and favours lateral curvature of the spine, which, in its turn, tends remarkably to diminish the capacity of the chest.

4. During inspection of the thorax, there are other circumstances, besides its form and size, which should fix attention. The actions of its parietes, the equality of the motions of each side, and their connection with the movements of the abdomen, are of the utmost importance. In pleuritis, the motions of the ribs of the affected side are greatly impeded; and if both sides be affected, the costal parietes are but little moved during respiration, this function being chiefly performed by the diaphragm and abdominal muscles. On the other hand, when the diaphragm, or either of its serous surfaces, are inflamed, or when intense inflammation affects any of the superior abdominal viscera, respiration is chiefly performed by the costal parietes. In the first case the respiration is said to be *abdominal*, in the second *thoracic*.

5. It is chiefly by actual inspection of the chest that we can ascertain the existence of œdema of its surface: the distance between the

ribs, the prominence of the spaces between each. the existence or non-existence of partial contractions, and bulgings or prominences of its walls, —are all important facts in our diagnosis of diseases seated in this cavity. Thus, in phthisis, when the pulmonary tissue is tuberculated, shrunk, or contracted, &c., a falling in of the ribs, particularly of the subclavian region of one or both sides, is observed; whilst in asthma and emphysema of the lungs, the ribs are full and expanded. This state, however, of the ribs may exist only on one side; as in cases of pleurisy of one side, terminating in effusion, in empyema, and in pneumothorax, we often observe the affected side expanded, and the intercostal spaces prominent, whilst the other is natural. In other instances of organic disease, one side may be uncommonly contracted; as after cures of old, or chronic, or circumscribed pleurisy, in partial or general destruction of one lung, and in lateral curvature of the spine. In many of these, the opposite or sound side is fully developed, owing to a slight hypertrophy of the sound lung; in cases of curvature, one side is always prominent in proportion to the depression of the other. The prominence of the sternum, and lateral depression of the ribs, which is so common in children; and the falling in of the sternum, and prominence of the ribs; are ascertained by inspection.

6. *B. Manual examination and mensuration.*— It is of importance to ascertain the existence of tenderness on pressure in various parts of the chest, particularly when the patient complains of pain, or difficult respiration. This can only be done by manual examination. Extreme sensibility of the external surface indicates either irritation of the membranes of the spine, or rheumatism affecting the parietes of the chest. When pressure in the intercostal spaces is required to develope the pain, disease is usually seated in the pleura, or parts beneath it, or in the pericardium. It is seldom, however, that we can occasion pain by pressing between the ribs in cases of organic disease of the substance of the lungs, or even of the pulmonic pleura, unless this latter has formed adhesions to the costal pleura. During manual examination, attention should be paid to the existence, the kind, and the extent of moisture on the surface of the chest; to its temperature, which is generally more or less increased in inflammations; and to the palpitations or impulse of the heart. It is evident that the existence of œdema or emphysema of the surface of the chest is chiefly to be ascertained by manual examination of it.

7. *Mensuration* of the chest may be sometimes required, in order to ascertain either the degree of prominence of one side, or of the contraction of the other. In both cases a piece of tape is used; the measurement being made from the spinous processes of the vertebræ to the central line of the sternum, and from the top of the shoulder to the lowest rib. The admeasurement should be taken during a full inspiration and expiration, and the progressive increase or decrease noted. It will often happen that no difference between either side exists during a state of tranquil respiration; and yet, upon forced respiration, the difference is very manifest.

8. Mr. Abernethy proposed, many years ago, —and the proposition has been recently revived on the Continent,— to ascertain the capacity of the lungs, by measuring the quantity of air they are capable of containing, as an indication of the extent of disease by which they are affected. The recommendation was rational, and deserving of greater attention in several affections of this organ than it has received, particularly when the evidence furnished by the measure is duly estimated in conjunction with other signs. The method simply consists of the patient taking as deep an inspiration as he is able, and then expiring through a tube, one end of which is passed under a glass jar, containing, and inverted over, water. The quantity of water displaced is the measure of the capacity of the lungs. A person, full grown and in health, usually displaces from six to eight pints. If the amount be much less than this, it may be inferred that the lungs are obstructed by disease of their substance, or by tumours, effusions of fluid in the pleura, or other causes pressing upon them externally. Although muscular debility, or spasm, may diminish the quantity of air inspired, yet there can be no doubt that the method is calculated to furnish very useful information.

9. Some years since, it was proposed by a physician on the Continent, to test the capacity and soundness of the lungs by causing the patient to take as full an inspiration as possible, and to count from one upwards, in a deliberate manner, during the following expiration, and whilst expiring as slowly as he can. The number that will be reached, either during the expiration or whilst the breath is retained, or before a new inspiration is entered upon, will be an index of the soundness of this organ. Dr. Lyons, who has more recently recommended a modification of this method, advises that the period should be noted by the seconds hand of a watch. He states that a healthy individual will not continue counting above thirty-five seconds; and that, in confirmed phthisis, the period never exceeds eight, and seldom six seconds. I have practised this method during the last five years, and have seldom found a healthy person who could proceed beyond thirty-five seconds, and scarcely one who could go beyond forty; but I have met several cases of pulmonary consumption, where, up to a very advanced stage of the disease, twelve, fifteen, and, in one case, twenty seconds were reached; and even in the last stage, eight or ten seconds are not uncommon; although the number mentioned by Dr. Lyons is much more frequent.

Percussion, *succussion*, and *auscultation* of the chest are comprised in the articles Auscultation and Percussion.

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Deformities of the Chest. — Classif. I. Class, III. Order (*Author*).

1. I. Lateral Depression of the Chest.—Depression of the lateral parietes of the chest had escaped the attention of authors, although of very frequent occurrence, until M. Dupuytren wrote a memoir on the subject (*Repertoire Gén. d'Anatomie, &c.* t. v. p. 110.) A few scattered remarks on the subject may be found in the writings of Van Swieten, J. L. Petit, Levacher, and

others, who have attributed it to rickets and other affections, and have evidently been unacquainted with its nature, causes, effects, and method of treatment. Not a week passes without cases of this contraction being presented at the Infirmary for Children; and although sometimes a congenital deformity, it has appeared to me very frequently to be greatly increased, if not altogether occasioned, subsequently to birth, by the very common practice among nurses of lifting the child by pressing the palms of the hand on the sides of the chest, immediately under the armpits. This deformity consists of a greater or less depression of both sides of the thorax, with a proportionate protuberance of the sternum and abdomen forwards, and of the vertebral column backwards.

2. It is most commonly found in infants born of debilitated, lymphatic, scrofulous, and rickety parents, — particularly those inhabiting low, cold, and moist situations, or who live in small ill-ventilated apartments, — and amongst children who are badly clothed and nourished. In many cases the deformity does not consist of merely a level depression of the lateral parietes; but the ribs are actually bent inwards, the sternum and spine forming a curve outwards. In some, the lower or upper parts of the sternum are the most prominent. This extreme grade of depression is seldom or ever met with at the moment of birth; M. Dupuytren thinks differently. My experience leads me to state that it generally comes on gradually after birth, owing to deficient inflation and developement of the lungs, arising from the weakness of the muscles of inspiration, and flexibility of the ribs at the time of birth. In cases of this description, the vital energy of the lungs is insufficient for their healthy actions, and the respiratory mechanism is unable to accomplish their full expansion, or to sustain the continued pressure of the atmosphere, before which the soft and imperfectly formed thoracic parietes gradually yield. The manner in which nurses frequently lift infants, as already stated, tends further to increase the mischief, particularly in those who are originally weak and ill-nourished. The effects of this coarctation of the thorax upon the functions, and ultimately on the structure, of the lungs and heart, soon become very evident. We usually find the pulse quick, and the breathing oppressed; with a weak voice, occasional anxiety, and incapability of speaking or reading for any time, or of uttering many words without frequent pauses. In the newly born infant, there is great difficulty of suckling, from its inability to raise the ribs with sufficient power to perform this process. It is seized with suffocation when at the mother's breast, which it often quits with fits of crying. As it advances in age, the disorder of respiration and circulation is still more remarkable, particularly upon ascending acclivities. The pulse becomes quick, irregular, or intermittent; and is accelerated upon the slightest cause, whether physical or mental.

3. In children whose chest is thus compressed, the tonsils generally, or rather constantly, become tumid, — so much so, as frequently to increase the disorder of the respiratory actions; and all the structures and organs of the body are impaired both in function and in developement, owing to the derangement which the depression occasions to respiration and circulation. In many cases which have come before me, rapid emaciation, great debility, defective assimilation and sanguifaction, an atrophied and flaccid state of the muscles, softening of the bones, frequently asthenic or chronic bronchitis, and swelling of the glands, have followed the deformity, and terminated the life of the patient.

4. *Organic lesions.* — In these cases the appearances observed on dissection are such as the original and consecutive ailments lead us to expect. These consist in retarded developement of the skeleton; want of union between the bones composing the cranium; enlargement of the heads of the long bones, sometimes with softening and flexures of their bodies. Dentition is also retarded; and, if it have proceeded, the crowns of the teeth are eroded. The voluntary muscles are atrophied, soft, pale, and exhibiting a fish-like structure. The lungs are compressed towards the vertebral column, and present a corresponding depression to that of the lateral parietes of the chest, with the marks of the ribs indented in their posterior and lateral surfaces. This organ is often studded with tubercles of various sizes; portions of it are frequently often inflamed or hepatised; and, in some cases, attended with bronchitis, the bronchi are more or less loaded with mucus, or muco-purulent matter. The substance of the heart is commonly pale and flaccid; and, in young infants, the foramen ovale is sometimes widely open; and in older children, but imperfectly closed. The mucous follicles of the intestinal canal are often tumefied, but rarely ulcerated, excepting when a chronic diarrhœa has attended the latter stages of the thoracic compression. The mesenteric glands are also occasionally much enlarged.

5. II. Depression of the Sternum, *with lateral prominence of the ribs.* — This deformity is the reverse of the former: the sternum is pressed inwards, either at its middle or lower part, or along its whole extent; the ribs are very much bent, and prominent laterally; the chest being broad, but compressed anteriorly, the shoulders high, and the spine either straight or but little altered from its natural form. This change has also been much overlooked by authors. Mr. Coulson, however, has lately noticed it in an instructive article on deformities of the chest. It is by no means uncommon both in young and grown up subjects, although not so frequent as the lateral depression. In cases of depression of the sternum, the lungs and heart are compressed anteriorly; their functions much altered, and ultimately their structures. This deformity is very seldom congenital, being the consequence of weakness, or of a scrofulous or tubercular diathesis. I have met with two instances of it out of six members of one family who died of consumption soon after puberty. It is in some cases antecedent of any apparent disease of the lungs; in other instances, it is consecutive of pulmonary disease; and in others, of external pressure and stooping occupations.

6. It is not uncommon to find females with the chest of a cylindrical or oval form, instead of being a truncated cone; entirely in consequence of the inordinate pressure to which its lower part has been long subjected from tight lacing of the stays. In some of these cases, the sternum, particularly its lower part, is pressed inwards. The effects, however, of this habit, and of the deformities which it occasions, have been alluded to in an-

other part. (See Chest — *Examination of the*, § 3.)

7. Treatment. — *A. The cure of the lateral depression of the chest* is by no means so hopeless as it may appear, particularly if it be attempted at an early period, and before serious organic mischief has been produced. Invigorating medicines and nourishing diet are requisite, particularly in conjunction with various external and mechanical means.

8. *a.* The *external* treatment which I have found the most successful, consists of warm or tepid salt water bathing in infants; and in directing the mother to make pressure very frequently through the day upon the protuberant spine and sternum, by placing one hand on the former and the other on the latter. But this pressure must be so managed as to be made only at the moment of expiration, and entirely suspended during the moment of inspiration, so that no impediment may be in the way of the free dilatation of the parietes of the chest. The practitioner should take care to instruct the mother in the manner of employing the pressure upon the sternum and spine, with the view of throwing outwards the depressed lateral walls of the chest. The more frequently this pressure can be employed, the better; and its benefits will be considerably promoted by applying the following liniment, night and morning, along the spine, or even upon both the sternum and spine. I have employed this and similar liniments, in these situations, with the greatest advantage, in this and several other diseases connected with debility, particularly in young subjects.

No. 110. ℞ Linimenti Camphoræ Comp., Linim. Saponis Comp., āā ℥j.; Olei Terebinthinæ ʒvj.; Benzoini ʒij.; Styracis Balsami ʒjss.; Olei Cajeputæ, Olei Limonis, āā ʒss. M. et fiat Linimentum.

9. In public practice, I have usually substituted for the above, either equal parts of the compound camphor and turpentine liniments; or these, with the addition of the soap liniment, or their equal quantities of olive oil and turpentine, with a little soft soap. In conjunction with these means, the artificial salt water bath, with a very large proportion of salt, at a temperature suited to the peculiarities of the case, will be found extremely serviceable. As soon as children affected by this depression of the walls of the chest can be brought to employ the muscles of the upper part of the body in a determinate manner, this mode of treatment should also be employed. Perhaps the best mode of overcoming the depression, by developing muscular action and power, is to cause the child to raise weights, by means of ropes and pulleys placed at a considerable height over its head; so that, by taking hold of the rope with both hands raised above the head, and pulling it downwards, the muscles may be brought into action, and the parietes of the chest thereby dilated. But moderate and duly regulated exercise, particularly of the muscles of the arm and trunk of the body, accompanied with invigorating medicines and regimen, will be productive of benefit.

10. *b. Internal treatment* should always be conjoined with the means stated above. The digestive functions generally require regulation, and tonic or permanent excitement. After having evacuated morbid secretions and fæcal accumulations from the bowels, by means of the usual purgatives, of which rhubarb, or senna combined with a tonic bitter, is among the most suitable, Brandish's alkaline solution, or the solution of potash, or other preparations of this substance, may be given, either in some gruel or mutton broth, or in a tonic infusion, or combined with the preparations of iron. The following powders may also be taken once, twice, or thrice daily: —

No. 111. ℞ Ferri Sulphatis exsic. gr. ij.—vj.; Potassæ Sulphatis gr. xij.—xx.; Pulv. Cascarillæ ʒj.—ʒjss. Misce benè, et divide in Cartulas xij. æquales, quarum capiat unam bis terve quotidiè.

No. 112. ℞ Potassæ Sub-carbon. gr. j.—iv.; Ferri Sub-carbon. gr. iij.; Pulv. Rhei gr. iv.—ix.; Pulv. Cascarillæ (vel Calumbæ) gr. v.—xij. Misce. Fiat Pulvis.

No. 113. ℞ Ferri Tartarizati gr. iij.—xvj.; Pulv. Calumbæ gr. vj.—xij.; Pulv. Zingib. gr. ij. M. Fiat Pulvis.

11. Instead of these, the tincture of ammoniated iron; mixtures containing sulphate of quinine; or the tincture of iodine, in doses of one to three drops, twice or thrice daily, may be employed advantageously. In every other respect the treatment is the same as that recommended for Rickets. But whatever mode of cure be adopted, change of air, or at least a wholesome pure air, with regular exercise, is requisite to its success. In this deformity, the various exercises resorted to with the view of imparting strength and agility to the frame, will be useful, if judiciously directed.

12. *B.* The *treatment of the other deformities of the chest* must be conducted very nearly on the same principles; the pressure, in cases where it may be proper to have recourse to it, being made in an opposite direction to that recommended above, when the anterior parietes are depressed. But this deformity is very seldom met with so early in life as to admit of any expectation of advantage from the use of pressure. The other means, as long as the pathological states of the thoracic viscera do not contra-indicate them, are the most applicable.

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CHICKEN-POX. Syn. *Varicella, Crystalli, Variola Spuria, Variola Lymphatica, Variola Volatica*, Auct. Var. *Variola Pusilla*, Heberden. *Exanthema Varicella*, Parr. *Synochus Varicella*, Young. *Emphlysis Varicella*, Good. *Verole Volante*, Fr. *Die Unüchten Kindspocken*, Ger. *Ravaglione*, Ital. *Water-jags, Water-pox.*

Classif. 1. *Class*, 3. *Order* (Cullen). 3. *Class*, 3. *Order* (Good). III. Class, III. Order (*Author*).

1. Defin. *An eruption over the body, of semi-transparent glabrous vesicles, with red margins, accompanying a slight attack of fever, seldom passing into suppuration; but, on the third day, bursting at their tips, concreting into small puckered scabs, and leaving no cicatrices.*

2. Under the name chicken-pox, or *varicella*, have generally been comprised certain eruptions, which closely agree in many features with each other, and which in some respects resemble small-pox. It is from this latter circumstance that they claim a very particular notice, as they are generally of so slight a nature as to require but little medical treatment. They were formerly very generally confounded with small-pox; but the difference between them was remarked as early as the beginning of the sixteenth century by Vidus Vidius and Ingrassias. Sennert and

RIVERI, professors at Wirtemberg and Montpellier at the commencement of the seventeenth century, and DIEMERBROECK, state that the distinction was well known in Germany, France, and Italy, to the vulgar, who had a separate appellation for this eruption. MORTON was the first in this country to mark the difference, and to describe this disease under the name "*chicken-pox*," by which it appears to have been commonly known before he wrote. Since then it has been noticed by FULLER, and accurately defined as a distinct disease by HEBERDEN. He, however, continued to designate it by the term *variola pusilla*; whilst his contemporaries, VOGEL, BURSERIUS, and SAUVAGES, also applied to it the generic term *variola*, with the specific designation of *volatica*, *spuria*, and *lymphatica*. But, as Dr. BATEMAN has remarked, this circumstance cannot be considered evidence of their considering it as generically the same with small-pox. The entirely distinct nature of chicken-pox was very generally believed in, since Dr. HEBERDEN pointed out the difference between it and the small-pox, until recently questioned by Dr. JOHN THOMSON, by whom the opinion of the earlier physicians, that they are merely varieties of the same disease, has been revived. This learned physician, and M. BÉRARD, urge in favour of this opinion the circumstance of variola and varicella appearing from the same exciting causes, whether those affected have been vaccinated or not; and affirm, that persons exposed to the infection of chicken-pox have caught small-pox, and that the former appears only in those whose constitutions have been modified by the influence of either small-pox or cow-pox. On this subject MM. SCHEDEL and CAZENAVE remark, that in those epidemics which they have had opportunities of noticing in Paris, the several eruptions might be classed under three heads: 1st, Variola properly so called; 2dly, The malady termed variloïde, or variola modified; 3dly, An eruption purely vesicular, offering every appearance of varicella. The same cause, namely, variolous infection, seemed to develope these several eruptions, which were observed in the same quarters, in the same streets, in the same houses. When the disease made its appearance among a numerous family, some had small-pox, some modified small-pox, and others chicken-pox. One circumstance was striking to every one, namely, the mildness of the disease in those persons who had been vaccinated, and in the majority of those who had already had variola.

3. These facts certainly favour the opinion of Dr. THOMSON; but, as the above writers have stated, many cogent arguments have been urged against it, especially by ABERCROMBIE, BRYCE, LUDERS, &c.: — 1st, It is very difficult to determine, during a small-pox epidemic, whether the occurrence of that disease among individuals coming in contact with persons infected with chicken-pox is rather the result of this communication, than of the variolous infection which at that moment developes the malady on all sides: 2d, Vesicular varicella, properly so called, is not transmitted by inoculation, and never produces variola: 3d, Those persons who consider chicken-pox as contagious, have confounded it with modified small-pox: 4th, Varicella appears in persons who have not been vaccinated, and who have never had the variola; consequently, in such cases, it cannot be regarded as a variola modified by the prior existence, either of this disease or of vaccination: 5th, Vaccination practised shortly after the disappearance of varicella pursues its course in the most regular manner, which never happens when vaccination follows variola: 6th, The progress of varicella is uniformly the same, whether it occurs before or after vaccination, or after variola: 7th, Variola sometimes reigns epidemically, without being accompanied by varicella; and, on the other hand, the latter may become epidemic without being attended by the former. In fact, the characters of the eruption, and the symptoms of varicella, differ essentially from those of variola.

4. I. DESCRIPTION.—*A. Of the eruption.* Under the name *chicken-pox* are included different varieties of eruption, generally characterised by very slight and brief antecedent fever, consisting of vesicles or very imperfect pustules which maturate and decline in three, four, or five days, occurring chiefly during infancy and childhood, but also at adult age, and occasionally prevailing epidemically. The generic term, *chicken-pox*, comprises three *species*, or rather varieties, which have been distinguished from each other for very many years in different parts of this country, by the popular names of chicken-pox, swine-pox, and hives. These WILLAN and BATEMAN distinguished, according to the form of their vesicles, into, 1st, *Varicella Lentiformis*; 2d, *V. Coniformis*; and, 3d, *V. Globularis*. Dr. GOOD has adopted these names and distinctions, but has added a *fourth*, the *V. Corymbosa*, the clustering or confluent chicken-pox; which, if considered at all as a distinct variety, is not of frequent occurrence; but has occasionally been observed by BATEMAN, RING, and myself.

Var. i. LENTICULAR CHICKEN-POX, *Varicella Lentiformis*; *V. Lymphatica*, Plenck.

5. This variety appears, on the first day of eruption, in the form of small red protuberances, of an irregularly circular, or rather tending to an oblong figure, with a nearly flat and shining surface, in the centre of which a transparent vesicle is very soon formed. On the second day of the eruption the vesicle is filled with a whitish lymph, and is about the tenth of an inch in diameter. On the third day the lymph is straw-coloured; and, on the fourth, the vesicles which have not been broken subside, and are puckered at their margins. Few of them are entire on the fifth day; but the orifices of several which have broken are closed or adhere, so as to confine a little opaque lymph within the puckered margins: on the sixth day, small brown scabs appear in place of the vesicles; and become yellowish on the seventh and eighth days, gradually drying from the circumference to the centre. On the ninth and tenth days they fall off, and leave for a time red marks on the skin, without depression. The disease may, however, be longer than now stated, owing to fresh vesicles appearing during two or three successive days, and going through the same stages as the first. The eruption is usually distinct, is general over the body, and comes out first on the back and breast. The vesicles, even when they suppurate, leave no cicatrices. The pustules of small-pox break out first on the face, neck, and breast, and always leave depressions.

Var. ii. CONOIDAL CHICKEN-POX, *Varicella Coniformis; Varicella Verrucosa*, Plenck; *Variola Lymphatica*, Sauvages; *Pemphigus Variolodes*, Frank; *Verolette*, Fr.; *Ravaglio*, Ital.; *Swine-pox*.

6. The vesicles of this variety arise suddenly, have a somewhat hard and inflamed base, and are on the first day acuminated, containing a transparent lymph. On the second day they are a little more turgid, their bases more inflamed, and the lymph in many of them is of a light straw-colour. On the third day the vesicles are shrivelled, and those which are broken have their lymph concreted into slight gummy scabs. Such of them as remain entire, and have their bases much inflamed, contain, on this day, a whitish puriform fluid; every vesicle of this kind leaving, after scabbing, a durable cicatrix. On the fourth day, thin dark brown scabs are seen intermixed with others, which are rounded, yellowish, and semi-transparent. These scabs gradually dry, separate, and fall off in four or five days.

7. A fresh eruption of vesicles usually takes place on the second or third day, and has a similar course to the preceding; the whole duration of the eruptive stage being thus six days in this variety of varicella. In some instances minute red tubercles appear, and subside without forming vesicles. The scales last formed are generally not not separated till the eleventh or twelfth day. In some cases, when the febrile symptoms have been severe, slight ulceration takes place in the vesicles from which the scabs have fallen off, leaving depressions or cicatrices, but only in parts subjected to pressure.

Var. iii. GLOBULAR CHICKEN-POX, *Varicella Globularis; Hives*.

8. The vesicles of this variety are large and globular, but their base is not quite circular. They are surrounded by inflammation, and contain a transparent lymph, which is slightly turbid, and resembles milk whey, on the second day of the eruption. On the third day they subside, become shrivelled as in the former varieties, and appear yellowish from the admixture of a small quantity of puriform matter with the lymph; some of them remaining in the same state till the following morning; but before the conclusion of the fourth day, the cuticle separates, and thin dark scabs cover the basis of the vesicles. The scabs dry, and fall off in four or five days afterwards.

9. *B. Of the constitutional affection.* — All these varieties of chicken-pox may attack the same individual at different epochs, and offer the same symptoms, whether before or after small-pox or vaccination. They are frequently associated with the epidemic prevalence of small-pox. They appear principally in the early months of the year, and the spring; seize chiefly young persons, and adults sometimes; and each of them, with few exceptions, affects a person only once in their lives. Varicella is preceded, for twenty-four or forty-eight hours, by chills, depression, anorexia, costiveness, and thirst, with heat of skin, flushed countenance, accelerated pulse, tendency to perspiration, and other febrile symptoms. Sometimes there is nausea, or even vomiting, with pain at the epigastrium and through the limbs. In some cases, the fever is so very slight as to be overlooked; and, in infants, is often indicated only by heat of skin and fretfulness. The eruption usually commences on the back and breast; appearing next on the face, neck, and scalp; and lastly on the extremities. It is sometimes preceded, for a few hours, by a general erythematous rash; and the vesicles are usually most abundant in the conoidal form; they being sometimes coherent, or seated close together, but seldom confluent. When thus coherent or clustering, they form the fourth variety of Dr. GOOD (§ 4.). Owing to the itching which accompanies them, children often break the vesicles by scratching; whence proceeds an increased inflammation, forming a yellowish pus, more or less consistent. This happens particularly on the face. The crusts which replace these pustules remain much longer, and leave small cicatrices. As the vesicles appear successively during two or three days, we may perceive the eruption exhibiting its several stages at the same period, in the same individual.

10. II. DIAGNOSIS. — The vesicle full of serum on the top of the pock, on the first day of the eruption, — the early abrasion of many of the vesicles, — their irregular and oblong form, — the shrivelled state of those that remain entire on the third and fourth day, and the radiating furrows of others which have had their ruptured apices closed by a slight incrustation, — the general appearance of the small scabs on the fifth day, at which time the small-pox pustules are not at the height of their suppuration, — sufficiently distinguish chicken-pox from small-pox. Dr. WILLAN has pointed out the characteristic circumstance, that variolous pustules are, on the first and second day, small, *hard*, globular, red, and painful; imparting the sensation, when the finger is passed over them, similar to that which one might conceive would be excited by the pressure of small round seeds under the cuticle. In varicella, almost every vesicle has, on the first day, a hard inflamed *margin*; but the sensation communicated to the finger is like that from a round seed flattened by pressure. As the pustules of small-pox, moreover, become gradually developed, they contain a white thick matter; the formation of which precedes suppuration, as shown by Dr. ASHBURNER. When the globular vesicles or hives appear, as is sometimes the case, intermixed with the lenticular or conoidal eruption, they afford a ready distinction from the small-pox, to the pustules of which they bear little resemblance.

11. It is not, however, so easy to distinguish varicella from modified small-pox. The symptoms precursory of the latter are usually intense, which is never the case with the former. In modified variola, the eruption is pustulent, and the pustules are small, circular, and generally depressed in the centre. After the scaly crusts drop off, tubercles are frequently seen, which disappear but slowly. In varicella, the vesicles, which are at first transparent, contain a fluid which becomes sero-purulent; and they are never followed by tubercles, as in modified variola. To this I must add, that varicella is not infectious; whereas modified variola may be transmitted by inoculation, and may even, in some cases, occasion a very severe attack of true small-pox.

12. III. The TREATMENT of varicella is very simple: the patient should remain in bed, in a temperate atmosphere; ought to be placed on low diet, and abstain from animal food for a few days;

should have the bowels duly regulated, and partake freely of lukewarm diluents.

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CHLOROSIS. Der. and Syn. From χλωρὸς, paleness, yellowish green. *Pallidus Morbus; Fœdus Virginum Color; Pallor Virginum; Morbus Virgineus; Fœdi Colores; Icterus albus; Icteritia alba; Cachexia Virginum vel Muliebrum; Febris Amatoria; Chlorosma, &c.* Auct. Var. *Chlorose; Pâles Couleurs*, Fr. *Die Bleichsucht*, Ger. *Green Sickness*, Eng.

Classif. 2. *Class*, Nervous Diseases; 2. *Order*, From Defect of Vital Energy (*Cullen*). 5. *Class*, Diseases of the Sexual Function; 2. *Order*, Affecting the Orgasm (*Good*). I. Class, II. Order (*Author*, in *Preface*).

1. Defin. — *Pale yellowish green complexion, languor, debility; depraved appetite, with occasional nausea or sickness, and disorder of the sexual secretions; generally occurring about puberty, or soon afterwards.*

2. Chlorosis has been very generally considered as a variety merely of amenorrhœa, particularly by Cullen, Pinel, and Frank, although they have classed it as a distinct disease. As to its occurrence independently of retained or suppressed menstruation, there can be no doubt, although it is frequently connected with such disorder. It is also similarly related to dyspepsia, and to anæmia; Dr. Young classing it with the former disease. Sauvages includes, as a variety of chlorosis, the cases of *anæmia* which occur in infants and children, denominating them the *chlorosis infantum*. But, although several such cases are met with in practice, they seldom present the yellowish green tinge of this disease, being usually of a white or exsanguineous paleness, unless when complicated with jaundice, which is but rarely remarked. They are entirely referrible, in respect of their pathological relations and terminations, to anæmia (see Blood — *Deficiency of*); and are sometimes, owing to the exhaustion attendant upon their last stages, mistaken for hydrocephalus. Sydenham considered chlorosis as a variety merely of hysteria, connected with a cacochymia, — its frequent complication with that disease being evidently the source of this fallacy; and, lastly, Van Swieten viewed it as a form of cachexy. These opinions serve to show the propriety of considering it as a distinct disease, but more or less intimately related to those complaints, owing to the circumstance of them all originating in a nearly similar state of vital energy, particularly as manifested in the organic nervous system; specific differences between them consisting in the particular viscus or part more especially affected, and in the grade and mode of such affection.

3. Dr. Good divides chlorosis into two species, the atonic and entonic; but this is an unnecessary refinement, no phenomena which warrant such a distinction presenting themselves in practice. Indeed, the entonic only consists of a state relatively of less deficiency of vital power than the atonic, and is, in many cases, merely the first stage of the disease; particularly when it occurs in tolerably strong females, and whilst the torpid function has not as yet extended much further than the sexual organs, in which it originated, the digestive, assimilating, and vascular organs not having sustained much disorder. Dr. Gooch has likewise made mention of an acute chlorosis, occurring chiefly in married women. But the state of disease thus designated by this physician, is simply that chronic disorder, often attended with slight irritative fever, following large losses of blood, which are not readily supplied by the digestive and assimilating functions; and is in all respects a state of anæmia. (See Blood, § 34. *et seq.*)

4. I. Causes. — *A. Predisposing causes.* Chlorosis is most frequent in girls about the age of puberty; either previously to the appearance of the menses, or when they are retained, or occur irregularly, or with difficulty. But married women, particularly widows and those who have not borne children, are not exempt. It is even met with in males, although rarely, about the period of puberty; as remarked by Hamilton, Blane, Desormeaux, Roche, and myself in two or three cases. When observed in this sex, it is apparently connected with protracted evolution of the sexual organs; and one or two of the young females of the same family are sometimes also affected. The lymphatic and melancholic temperaments; feeble and delicate constitutions; residence in cold, moist, and miasmal localities and climates; insufficient, unwholesome, innutritious, and watery vegetable food; inattention to the digestive functions, particularly those of the bowels; the abuse of diluents, of acid weak wines, or of spirituous liquors, early in life; too great indulgence in warm bathing; prolonged sleep; tight lacing at an early age; and whatever debilitates and relaxes the system; predispose to this disease. The most frequent causes in this country are sedentary occupations in crowded and ill-ventilated manufactories and towns, especially those employments which require a stooping position, and are prosecuted by females at a very early age, or before the frame is developed.

5. *B.* The more common *exciting causes*, are longings after objects of desire; depressing passions and affections, especially unrequited love, or unfortunate or imprudent attachments; long entertained feelings of sadness or anxiety, particularly when caused by removal from friends, and the scenes of recent happiness and affection. According to MM. Desormeaux and Roche, privation of the physical gratification of love is a very frequent cause. Retention, difficult and imperfect occurrence of the menses, have very generally been enumerated amongst its causes; but the uterine disorder is rather a coincident effect of the same pathological state that produces chlorosis (§ 12.). Suppression of the menses, excessive menstruation, and manustupration, are sometimes concerned in its appearance; the latter acting chiefly by debilitating the frame generally, by exhausting the energy of the sexual organs, and

thereby assisting the operation of other causes, particularly when the functions of the stomach and bowels are torpid, or otherwise disordered. The influence of constipation, and fæcal collections in the cæcum and colon, in occasioning the disease, cannot be questioned, although somewhat exclusively insisted upon by Dr. HAMILTON, in opposition to the opinion of Dr. CULLEN, who referred it chiefly to an inactive state of the ovaria. It seems, however, quite as evident that the torpor of the digestive organs, especially of the lower bowels, and the inactivity of the uterine organs, depend upon the state of the organic system of nerves, which supply not only those viscera, but also those concerned in assimilation and circulation, — all those functions presenting more or less disorder in the course of the disease.

6. II. HISTORY AND SYMPTOMS. — Chlorosis presents two stages; the *incipient*, and the fully developed or *confirmed*. It also manifests various morbid associations or *complications*. *A*. The *incipient* stage commences insidiously, and almost insensibly. The patient is at first languid, listless, weak; loses her complexion; has no disposition to amusement, if it require mental or physical exertion; is often without appetite, or craves for particular, and sometimes unwholesome, kinds of food; the bowels are costive; bodily exertion soon occasions shortness of breath, and fatigue; the breath is offensive; the tongue is white or pasty; sleep is disturbed or unrefreshing, and oppressive in the morning; she often complains of intermittent headach, pain of the left side, and palpitations, which are induced by the slightest cause; the pulse is quick, weak, and small; and the catamenia are either retained, or are scanty, and of a pale colour: all these symptoms gradually increase, and the countenance becomes more and more pale, and assumes a greenish yellow tint.

7. *B*. The *fully developed* disease presents its characteristic complexion—the pale greenish yellow of an etiolated plant. The lips, gums, insides of the cheeks, are pale; the eyelids are livid, sometimes œdematous, particularly in the morning; the conjunctivæ are remarkably white; the soft solids flaccid; the extremities cold; and the ankles œdematous. The tongue is usually pale, soft, flabby, and indented at the edges by the teeth; sometimes it is smooth, glossy, and fissured. The appetite is more and more capricious and morbid; sometimes with pica, or a desire for pickles and acids; and nausea and vomiting, especially in the morning, and cardialgia or gastrodynia after meals, not infrequently occur. If the menses have already appeared, they become gradually more difficult, and scanty; are attended with syncope or pain; are of short continuance, pale, or watery; recur at longer periods, and at last disappear. The patient is often sad; entertains depressing and sinister ideas; prefers solitude, and is capricious. In the more advanced or inveterate cases, the finger nails are brittle, dry, and split or break off; the hair is weak, falls out, is lank, dry, and splits at its extremities. The abdomen is often tense, distended, and slightly painful. A constant pain is complained of under the left breast, sometimes with a slight cough; the constipation alternates with diarrhœa; some degree of emaciation takes place; the œdema extends, or assumes the form of anasarca or ascites; various irregular states of hysteria occasionally appear during the course of the disease; and some one or two symptoms become prominent, occasionally deceiving both the patient and medical attendant by their severity. Thus the headach, pain of the side, palpitations, cough, &c. occasionally lead to the apprehension of inflammatory states of the brain, or of the pleura, of disease of the heart, or of phthisis.

8. *C. Terminations and complications.* — When the disease becomes inveterate from neglect, inefficient treatment, or the continued operation of its causes, &c., it often assumes diversified forms, owing to morbid associations. The continued disorder and debility of the digestive organs, and the consequent insufficient supply of healthy chyle to the blood, as well as the imperfect sanguifaction of what is supplied to it, sooner or later gives rise to anæmia, which, in its slighter grades, owing to the causes hereafter to be noticed (§ 12.), even accompanies the early stage of chlorosis. In females who have been married, or in those who, previously to the appearance of the disease, had the uterine functions and discharges regularly and fully established: hysteria, in some one or more of its numerous states, is commonly observed. Chlorosis is sometimes also complicated with swellings of the glands, or with chronic cutaneous eruptions, or with hæmatemesis and malæna; and occasionally terminates in dropsy of either the thoracic or abdominal cavities. Mania and delirium rarely ensue in the course of its advanced stages and inveterate forms.

9. III. DIAGNOSIS. — Chlorosis is most intimately related, in its symptoms, and the nature of the changes which constitute it, to anæmia. Indeed, the advanced stage of the former is often identical with the latter; the chief differences consisting in the pale, greenish, or greenish yellow tint of the countenance, the torpor or disorder of the uterine functions, and affection of the stomach in chlorosis. It also often resembles other chronic diseases, particularly those seated in the stomach, and tuberculous affections; but not so closely as to be mistaken for them. Neither the nervous headach, nor the hysterical pains, particularly those complained of in the left side and under the left breast, nor the palpitations of the heart, can with due attention be confounded with inflammation or organic change in these situations: yet have I seen these mistakes made, and nearly fatal consequences ensue,—the practitioner having been deceived by the frequency of the pulse in such cases. In this, as well as in other diseases, much advantage will accrue from recollecting that the most acute pain is generally owing to a pathological state the reverse of inflammatory; and that the most frequent pulse is very far from indicating a necessity for blood-letting, which, if practised in such cases, will increase the morbid sensibility and the vascular irritability, even when it does not hasten a fatal termination.

10. IV. PROGNOSIS. — Chlorosis is always chronic; is generally cured, particularly in its simple form; but sometimes also terminates fatally, owing to the associated lesion of various functions and organs. Recovery may be confidently expected, when it is incipient or uncomplicated, and none of the internal viscera betray marked disease; especially if it have not continued longer

than two or three months, and the menses have not appeared. If it occur in married women, sterility is often the consequence; or, if children are borne, they are generally feeble and unhealthy. Chlorosis should be viewed in a serious light, if it have been of long duration; if the catamenia, after having appeared, are gradually suppressed; more particularly if the signs of anæmia to a considerable degree be present; if emaciation be rapid, with quick respiration and cough; if the œdema of the extremities extend; if symptoms of effusion of serum into the cavities supervene; if hæmatemesis or malæna occur; and if it have resisted, in its early stage, a judicious treatment. In the advanced progress of the disease, especially when it is complicated, death sometimes takes place unexpectedly, but seldom without evidence of excessive depression of the organic nervous influence, and of great deficiency of the circulating fluid. (See Blood, § 42. *et seq.*)

11. V. Pathology. — *A. Morbid appearances.* The adipose substance is sometimes not much diminished; but the rest of the soft solids is flaccid and pale, from a deficiency of the red blood. Effusion of serous fluid is commonly met with in the large cavities, particularly those of the pleura, pericardium, and peritoneum, and occasionally also in the ventricles of the brain. The lungs are frequently œdematous, or studded with tubercles; the liver is often enlarged, and sometimes pale or tuberculated; the stomach small, pale, and contracted; the mesenteric glands slightly enlarged; the ovaria and uterus, in some instances, are imperfectly developed, or contain small tumours; the cavities of the heart are occasionally somewhat enlarged, and their parietes are generally flaccid and pale, or slightly atrophied; the blood is commonly pale, aqueous, and deficient in coagula, — those which are found in the large veins and auricles of the heart being of a very light colour, and small. These are the most common lesions; but others are sometimes noticed, both in the organs now mentioned, and in different parts, as in the spleen, pancreas, gall-bladder, kidneys, &c. In some cases but little change beyond the exsanguineous state of the various structures are observed, as in those recorded by Lieutaud.

12. *B. Nature of the disease.*—It has been considered by many writers, and amongst others by Wedel, Korte, Cullen, Desormeaux, and Roche, that chlorosis is chiefly dependent upon debility or torpor of the nervous influence developing and actuating the ovaria and uterus. Hoffmann, Darwin, and Saunders connect it more immediately with obstructed function of the liver. Hamilton refers it chiefly to torpor of, with accumulated sordes in, the digestive organs, particularly the lower bowels; and Andral, to the deficient and morbid state of the blood. If we reflect upon the character of the associated phenomena constituting the disease, in relation to their causes on the one hand, and to their consequences and terminations on the other, we must necessarily arrive at the inference, that all the organic functions — those of digestion, assimilation, sanguifaction, nutrition, and generation, — are inadequately performed; and, as the organs devoted to these offices are intimately connected one with the other, and actuated by the organic nervous system, that consequently the vital energy of this system is insufficient for the purposes it is destined to perform. We know that the evolution of the sexual organs is owing to the state of vital power; and that, by a reciprocal influence, the activity of those organs increases all the other functions of the frame. Therefore, as we commonly observe this disease at the period of puberty, and associated with imperfectly developed or performed function of the sexual organs, we must necessarily infer, that the defective energy of the organic nervous system delays or arrests their developement, and weakens their functions; the whole frame being thereby deprived of the stimulus they impart to it. Consequently, if the causes continue to operate, or if this system experience no salutary or natural excitement, all the organic functions languish more and more; the chyle is imperfectly prepared; and sanguifaction and assimilation are inadequately performed; all the phenomena of an advanced state of the disease being the result.

13. VI. Treatment.—*A.* In its *first stage,* this affection is generally soon removed, 1st, by a due attention to the causes,—particularly the mental or moral causes, — and by removing or counteracting them as far as possible; 2d, by evacuating all morbid and accumulated sordes from the alimentary mucous surfaces, and regulating the alvine secretions and excretions; and, 3d, by imparting vigour to the digestive and organic functions, and exciting at the same time the torpid or imperfect actions and secretions of the uterus. It will generally be necessary to ascertain the causes of the affection, or to direct the attention of the friends of the patient to their nature, tendencies, and the best means of counteracting them. The medical treatment may be commenced with a moderate dose of calomel or blue pill, and a few grains of powdered ginger, given at bed-time; and the following morning the secretions should be more fully promoted and evacuated by a dose of castor oil, or of the compound decoction of aloes. After the bowels have been freely evacuated, the following pills, or Form. No. 877. should be taken daily, either during or after dinner: —

No. 115. ℞ Alöes Socot., Ferri Sulphatis, āā gr. ij.; Gum. Mastich. gr. j.; Pulv. Capsici gr. ij.; Syrup. Simp. vel Olei Caryoph. q. s. M. Fiant Pilulæ duæ.

During the use of these, it will generally be requisite to promote the functions of the liver, and excite the bowels, by the occasional repetition of the calomel and ginger at bed-time, and the purgative draught the following morning. In some cases, the operation of the medicine may be very advantageously promoted by an enema. In many instances, nothing beyond what is now recommended will be necessary; but, in addition, a course of chalybeate mineral waters may be directed; and, under every circumstance, exercise in the open air, particularly on horseback, change of air to the sea coast, a light nutritious diet, and warm clothing, especially of the lower extremities, should be recommended. Flannel drawers will be found of service in winter.

14. *B.* In its *second stage,* or in the more obstinate cases, or when the affection is attended with difficult or scanty menstruation, the tinct. ferri ammoniati, or the tinctura guaiaci ammoniati, and the phosphate of iron, are preferable to the sulphate of iron,—the compound aloetic de-

coction being the most suitable aperient. When pains of the head, or of the left side, or other symptoms of hysteria, or palpitations, are complained of, these medicines will be advantageously associated with camphor and hyoscyamus. When the torpor of the uterine system is evident, conium will, however, be preferable in such cases to hyoscyamus, and may be given either with these medicines, or with any of the ammoniated spirits. In a few obstinate cases of the disease, I have prescribed, with marked advantage, small doses of the extract of nux vomica, and the *strychnine*, as in Formulæ 542. 565. and 907.

15. If the disease still persist, if the ankles swell, or if dropsical symptoms come on, and the menstrual evacuations continue suppressed, advantage will sometimes accrue from rubbing the loins assiduously every night with either of the liniments, Form. No. 296. and 311., and acting gently on the bowels by means of the following pills: —

No. 116. ℞ Pilul. Alöes cum Myrrha ʒj.; Saponis Castil. ʒ ss.; Olei Crotonis Tiglii ♏ iij. Contunde benè simul, et divide in Pilulas xxiv., quarum omni nocte capiat unam, binas, vel tres.

16. In the course of practice, I have seen three cases of the disease complicated with swelling of the parotid and submaxillary glands. In order to remove these tumours, I prescribed *iodine* internally, in small and frequent doses, giving also at bed-time the aloes and myrrh pill. In these instances, the menses gradually came on, and all disorder vanished. I have on other occasions observed a very marked emmenagogue, as well as tonic effect, produced by the preparations of iodine; and from these effects, as well as from their efficacy in the above cases, I consider them calculated to prove of use in certain states of obstinate chlorosis. On some occasions, particularly when chronic eruptions appear in the course of the disease, sulphur will be found the best aperient, and the following pills will be productive of benefit; but, in addition to those already particularised, several recipes will be found in the Appendix suited to the different forms and complications of this affection, as well as of other derangements of the uterine functions.

No. 117. ℞ Sodæ Sub-boracis ℈ij.; Sulphur. Præcip. ʒj.; Mucilag. Acaciæ q. s. Fiant Pilulæ xxiv., quarum capiat tres ter quotidiè. (See also F. 519.)

No. 118. ℞ Sub-boracis ℈ ij.; Pulv. Capsici Annui ℈ j.; Pilul. Alöes cum Myrrha ʒj.; Olei Sabinæ q. s. M. Fiant Pilulæ xxx., quarum capiat binas ter die.

No. 119. ℞ Ferri Sub-carbon. ʒ j.; Sulphur Depur. ʒj.; Myrrhæ Alöes Soc., Fellis Taur. Insp., āā ʒss. Contunde benè simul, et divide in Pil. gr. iv., quarum sumat binas vel tres bis terve in die. (*Recommended by* Richter.)

17. Electricity and galvanism have been advised by Renaud and Sigaud la Fond for this disease; and the ammoniated copper, by Bianchi. The preparations of iron have very properly been directed, in conjunction with the alkalies and myrrh, by Willan, with stimulants and bitters, by Schæffer, with assafœtida, by Hirschel, and with cinchona and rhubarb, by Ranoë. Marriage has been suggested as a remedy for chlorosis, by Wedel, Le Blanc, Korte, and several others. Cold bathing has been recommended by Brandis, and condemned by Darwin; and purgatives have been chiefly depended upon by Hamilton. The use of mineral waters is certainly of much service in chlorotic cases. Those of Driburg, Pyrmont, Spa, Carlsbad, &c. on the Continent, have been much praised by Brandis, Marcard, and Kressig; and the chalybeate springs in this country, by most practitioners. But equal advantage will sometimes accrue, in the inveterate forms of the disease, from the sulphureous and saline waters, in addition to a judicious course of medicine; and from the Bath and Buxton warm springs, used in the form of baths. The warm hip-bath, some salt and a little mustard having been added to the water, is also beneficial. (See Menstruation.)

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CHOLERA. Syn. *Cholera Morbus, Passio Cholerica, Diarrhœa Cholerica*, Auct. Lat. *Cholérée, Cholerragie, Trousse-galant*, Fr. *Die Gallenruhr, Brechruhr*, Ger. *Diarrhœa Cholera*, Young.

Classif. 2. *Class*, Nervous Diseases; 3. *Order*, Spasmodic Affections (*Cullen*). 1. *Class*, Diseases of the Digestive Functions; 1. *Order*, Affecting the Alimentary Canal (*Good*). II. Class, III. Order (*Author*, in *Preface*).

1. Defin. *Griping pains, followed by vomiting and purging, very rarely with flatulent eructations and dejections, and always with spasms of the extremities, particularly the inferior, and anxiety.*

2. I. History and Symptoms. — The term Cholera has been in use since the time of Hippocrates, who admitted two species of the disease, — one humid, the other dry, — χολέρα ὑγρῆ, χολέρα ξηρὰ. According to Celsus, it is derived from χολῆ, and ῥέω, signifying literally *bile-flux*. Trallian, however, derives it from χολὰς and ῥέω, *intestinal flux*. Galen, adopting the distinction established by Hippocrates, attributed the humid cholera to the presence of acrid humours generated by the corruption of the food; and the dry cholera, to an acrid flatus. With very slight modifications, this doctrine was received by Fernel, Baillou, Sydenham, F. Hoffmann, Bianchi, Sauvages, and Vogel, the difference chiefly consisting in the part they ascribed to the bile, and to the state of this secretion, in the production of the disease. Cullen directed attention, more accurately than his predecessors, to its nervous and spasmodic characters. Pinel was, however, the first who made any considerable innovation on the opinion of the Ancients as to its nature. He classed it as a species of the genus of fevers, to which he applied the term of *Meningo-gastric*. M. Geoffroy (*Dict. des Scien. Méd.* t. v.) subsequently attributed to it an inflammatory character; and MM. Broussais and Gravier afterwards contended that it consists of inflammation of the mucous surface of the digestive tube commencing with nervous symptoms.

3. This diversity of opinions will be fully accounted for in the sequel; but I may at present remark, that they may be in many respects reconciled, inasmuch as the particular form of disorder, for which each exclusively contends, frequently exists as a part of the morbid condition constituting the disease. After having paid considerable attention to the literature of cholera, and had much experience of all its forms — of two of them in my own person — I consider that it admits of division into the following distinct *varieties*: — 1st, The *Cholera Biliosa*, or bilious cholera; 2d, *Cholera Flatulenta*, flatulent cholera; 3d, *Cholera Spasmodica*, the spasmodic cholera, or *Mort de Chien*. As I believe the disease which has appeared in recent times, and has received numerous appellations, among which that of *epidemic* cholera has been most commonly used, to be a different malady from the other forms of cholera, I have treated of it in a distinct article. (See Pestilence.)

i. Cholera Biliosa, *Bilious Cholera*; χολέρα ὑγρῆ, Gr.; *Cholera Humida*, Lat.; *Cholerràgie*, Fr.; *Die Gallenruhr*, Ger.

4. Defin. *Copious and frequent vomiting and purging, at first of the alimentary and fæcal matters, with a redundancy of bile, and spasms of the legs and thighs.*

5. *Causes, States, &c.* — This is the most common variety, and presents itself *sporadically*, *endemically*, and in an *epidemic* form. When it appears *sporadically*, it is often slight, and of short duration; but it is also sometimes extremely severe, according to the state of the patient, and nature of the exciting causes. In this form, it is not infrequently met with during summer and autumn, and but very rarely in spring. It generally attacks persons whose bowels and secreting viscera have either been, for some time previously, in an inactive state, or become loaded by an accumulation of retained, and thereby altered secretions, particularly bile; and arises from exposure to the sun's rays, or to a high degree of temperature, and afterwards to cold, or cold combined with moisture, particularly when applied to the extremities; from sudden atmospheric vicissitudes, particularly cold easterly or northerly winds after hot weather; from cold miasmal night air, and dews, after a warm sun; cold drinks when the body is overheated, and the incautious use of ices; from cold, indigestible, or unripe fruits, particularly melons, cucumbers, pine-apples, and poisonous or irritating ingesta of any kind; the excessive use of spirituous or malt liquors, and ingurgitation; from large doses of cathartic or emetic drugs (Henry, *Diss. de Chol. Morbo.* Hal. 1740.); fright, particularly from thunder (*Phil. Trans.* 1667.); and from whatever occasions a sudden depression of the vital energies of the frame, and irruption of accumulated bile into the duodenum.

6. The intimate relation existing between this species of cholera, and the *colica cibaria* or surfeit, in respect of their causes, and several of their symptoms, did not escape the notice of Sydenham. Dr. Good has also remarked the similarity. But the distinctions are nevertheless sufficiently marked, and more numerous than those writers have assigned. The spasms of the extremities in the latter; the retraction of the testes, the copious vomitings and alvine evacuations, with redundancy of bile, particularly after the vomiting and purging have continued for some time, and the more acute character of the disease, are sufficient to mark the wide difference between them.

7. In the *endemic* form, cholera is seldom presented to the observation of practitioners in northern countries. To certain districts in some southerly climates, particularly between the tropics, bilious cholera may be said, from the frequency of its occurrence, to be strictly endemic, although in a less marked degree than certain forms of fever, or dysentery, or even hepatitis. According to my own observation, and that of several friends whose range of experience has been great, bilious cholera is very prevalent in situations which are subject to emanations from decayed vegetable matter, or putrid matter of any description; particularly from swamps, moist grounds, the banks of rivers, lakes, or canals, &c., and from foul drains or cesspools, during warm seasons, or wide and rapid changes of temperature; or when the thermometer rises high during the day, and sinks low towards the night and morning.

8. Bilious cholera assumes the *epidemic* form, sometimes in warm climates, and not infrequently also in temperate countries. In the latter, this form of the disease manifests itself only in the months of July, August, and September, — the number of cases increasing from June to September, when they are usually most numerous, and diminishing rapidly in October. The epidemic bilious cholera is generally most remarkable during very warm summers and autumns, occurring after a very rainy winter and spring, or after a succession of wet seasons; and when the days have been warm, bright, and sunny, and the nights comparatively cold or chilly, with heavy dews. Owing to this state of season, the atmosphere is humid, and loaded with the miasms of decayed vegetable and animal matter; and, owing to this cause, together with the high range of temperature, the bile is secreted in greater abundance than usual, and is more liable to become acrid or otherwise altered (see Liver — *Disordered Function of the*); and the cool nights, particularly if the air be much loaded with exhalations set free from the soil by the rays of a scorching sun, tend to check the cutaneous exhalations, and determine the chief current of circulation and secretion to the abdominal viscera. The use of fruit, which is usually abundant at these seasons, also augments the frequency of the disease, by promoting the operation of the other causes. It increases the acidity of the prima via, as contended for by Bertrand and Linnæus, renders the contents of the bowels, and the secretions poured into them, of a more irritating quality to the nerves of the stomach and intestinal canal, and thereby often promotes the irruption of acrid bile, which had been long pent up in the gall-bladder and hepatic ducts, and which is a great cause of irritation when it is suddenly poured into the duodenum.

9. During states of temperature and of season which favour the extrication of exhalations from the soil, the epidemic visitations of this variety of cholera are more severe. In many cases, occurring at these periods, the disease can scarcely be imputed to the state of the biliary secretion merely, but rather to the internal congestions occasioned by its exciting causes, giving rise to

spasmodic contractions of the alimentary canal, to vomiting and purging, and to spasms of the voluntary muscles, &c.; the bile accumulated in the gall-bladder and hepatic ducts being let loose and thrown into the intestines only subsequently to the seizure, and owing to the vomitings and purgings which usher it in. In some cases, indeed, this irruption of bile is prevented from taking place, until an advanced stage, by spasm of the common duct, extended to it from the duodemum, as more commonly occurs in the third variety of the disorder. When the various *causes* now referred to combine to produce the disease, particularly in persons of a nervous and irritable temperament, and who have neglected, for a considerable time before, the state of the bowels, and secretions poured into them, it cannot be a matter of surprise, that its *symptoms* assume the severe form described by SYDENHAM.

10. *Symptoms.* — Bilious cholera, in whatever state it occurs, differs chiefly in its degree of severity. It is chiefly characterised by anxiety, and by painful and violent gripings, evidently proceeding from spasmodic contractions of the alimentary canal, taking the duodenum for their point of departure, and occasioning the continued or frequently repeated rejection of their contents by vomiting and purging. Owing to the anatomical connection of the great sympathetic or ganglial system with the voluntary nerves and other parts of the frame, the spasms extend to the abdominal muscles, and muscles of the lower extremities, — the testes being forcibly retracted to the abdominal ring, — and are accompanied with great pain. The tongue is dry or clammy; thirst is very urgent, and the urine scanty and high coloured. The pulse is at first full and frequent; but, as the disease continues, it becomes smaller, weaker, and more rapid. At more advanced periods, the spasms sometimes extend to the arms and hands. The symptoms often continue with little variation for some hours; but, when the attack is severe, seldom without the patient's strength being greatly reduced; the countenance at last becoming anxious and collapsed; the breathing frequent, interrupted, and laborious, and sometimes with singultus; the pulse feeble, irregular, and intermittent; and the extremities cold or clammy, with leipothymia or fainting.

11. *Duration* and *Prognosis.* — The cholera of temperate climates is seldom fatal, unless when it is more than usually prevalent, after very rainy and hot seasons. But, when neglected or improperly treated, especially at such times, a fatal issue may occur, but very rarely in less time than twenty-four hours. In milder cases, it may extend to two or three days, and then terminate either favourably or unfavourably, most commonly the former; the vomiting, purging, and spasms subsiding, and entirely ceasing, the pulse becoming slower and fuller, and the countenance resuming its former expression. An unfavourable issue is indicated by a continuance of the purging and vomiting, particularly after substances are taken into the stomach, a hurried, gasping respiration; great frequency, feebleness, irregularity, and intermissions of the pulse; collapse and paleness of the countenance; coldness and pulselessness of the extremities, with anxiety, and frequent faintings, &c. In general, however, even when left to itself, the disease operates its own cure in the course of some hours; or it continues for one, two, or in milder cases for even three days, and ceases by degrees; the morbid secretions which excited the attack having been evacuated, and the irritation they occasioned having subsided. Although nature may accomplish this without aid, yet the assistance of art is generally required to ensure its attainment. The febrile symptoms attending the early stage of the disease, unless in some instances of its epidemic prevalence, are merely the consequence of the pain, spasms, vomitings, and general commotion of the nervous system, and usually subside immediately these disorders are allayed.

ii. CHOLERA FLATULENTA, *Flatulent Cholera;* χολέρα ξηρὰ, Gr.; *Ch. Sicca*, Lat.

12. DEFIN. *Vomiting and purging rare, sometimes retchings; gripings and spasms of the abdominal muscles, with great and oppressive flatulence, temporarily relieved by eructations, and dejections of flatus.*

13. This variety was formed by HIPPOCRATES, continued by SYDENHAM, and, after having been discontinued by the majority of modern writers, who, if they at all remarked it, considered it rather as a form of colic than of cholera, was again distinguished as a species of this latter disease by Dr. GOOD. It is very rarely met with in practice; and generally holds an intermediate rank between flatulent colic and cholera, sometimes approaching more nearly to the former. In none of the very few cases of this description which have come before me (not exceeding two or three), have I observed a natural secretion of bile; but, on the contrary, the liver has evinced signs of great torpor, and the whole digestive organs have been manifestly enfeebled, long protracted dyspepsia and hypochondriasis having existed previous to the attack.

14. This form of the disease is chiefly characterised by spasms of the alimentary canal, apparently excited by acrid, rancid, and indigestible substances; and by an irritating gas, either secreted from the digestive mucous surface, or generated from the decomposition of the imperfectly digested food. (See articles COLIC and FLATULENCY.) The painful and flatulent griping is accompanied with severe spasm of the abdominal muscles, anxiety, occasional retchings, flatulent irritations, and calls to stool, with slight tenesmus, and very scanty, offensive, pale coloured, and watery evacuations, with flatus. Considerable depression of the powers of life, acceleration of pulse, pale, anxious countenance, coldness of the extremities, and sometimes alarming sinking, supervene, when the disease has been neglected.

15. *Causes.* — This rare form of cholera chiefly appears in the debilitated, and those of a melancholic temperament; and is generally excited by a surfeit, by cold drinks when the body is overheated, by the use of cold or unripe fruits, particularly melons, water-melons, cucumbers, unripe plums, mushrooms, and animal poisons, especially the rank parts of bacon, or tongues, sausages, &c. when kept too long, or insufficiently cured; also by unhealthy or stale fish, and by cold or moisture after having been exposed for some time previously to a high range of temperature. The author was very recently the subject of an attack as described above, from having partaken of

tongue kept too long after having been imperfectly cured. In this case the affection was much more nearly allied to cholera than to colic; and this he is the better enabled to state, from the circumstance of having been the subject of the other varieties of the former disease at different periods of his life.

iii. CHOLERA SPASMODICA, *Spasmodic Cholera; Mort de Chien*, Fr.

16. DEFIN. *Vomiting and purging of watery matters, without any appearance of bile; spasms violent, and extending generally through the frame; speedily followed by sinking of the powers of life.*

17. This variety of cholera may be said to be *endemic* in some intertropical countries, particularly in the eastern hemisphere, where it has occasionally assumed also an *epidemic* form, nearly approaching the remarkably fatal *pestilential cholera*, which appeared in Bengal in 1817, and which has subsequently spread over all Asia, Europe, and part of Africa. (See PESTILENCE.) It has been very imperfectly noticed by BONTIUS, CURTIS, PAISLEY, SONNERAT, and GIRDLESTONE; but its nature and treatment were very imperfectly known, until Dr. JOHNSON described its symptoms, and pointed out a more successful method of cure than had previously been employed. Several of the cases of cholera, which SYDENHAM has described as epidemic in 1669, seem to have been of the variety now under consideration.

18. *Causes, symptoms, &c.*—This form of cholera proceeds from exposure to cold, or to a cold, raw, and moist atmosphere, or to the night air loaded with terrestrial emanations after the prevalence of warm weather, or exposure to a hot sun; or, in a word, it generally results from a more intense grade of the same causes, particularly the exhalations from the soil, that produce the bilious cholera. It commonly commences with chilliness, sometimes amounting to a rigor or shiver; soon followed by gripings, and frequent purging of a watery, slimy, or sero-mucous matter, which is sometimes thrown off with great force. To these succeed nausea and retchings, with the ejection of a watery fluid; anxiety at the epigastrium; spasms of a violent, painful, and tonic character, attacking the muscles of the abdomen, thighs, legs, thorax, and, lastly, the arms and hands; a small, quick, and contracted pulse; great thirst, and immediate rejection of whatever is taken into the stomach. As the disease proceeds, the pulse becomes weaker and smaller; the spasms more general; the purging constant and painful, generally with tenesmus; the vomitings are renewed, upon the ingestion of substances into the stomach; and the powers of life rapidly fail. During this time, the fluids evacuated from the stomach and bowels present no appearance of bile, although occasionally bile is seen in the evacuations to a small extent. In the course of a few hours, the features shrink, the hands and feet become cold and clammy, the exacerbation of the spasms force out a cold clammy sweat on the face and breast; the pulse extremely small and weak, or nearly disap-ars; — in a case which came before me in Africa, 1816, the pulse could scarcely be felt four urs from the attack; — the spasms assume more the clonic character; and the contents of the nach are now, in the more dangerous cases, sometimes thrown off, without any effort or retching. Commonly, during all this time, fæcal matters, and the biliary secretions are retained, apparently owing to the extension of the spasm from the duodenum to the common biliary duct, and to spastic constrictions of parts of the colon; the epigastrium and hypochondria being sore, tense, and tumid. When the disease is treated with decision, the vomitings cease; free evacuations, with a discharge of bile, take place; and the patient soon recovers. But if neglected, or improperly managed, the powers of life fail very rapidly; the eyes sink, and are surrounded with a livid circle; the countenance assumes a remarkably anxious cast, or is pale, wan, and shrunk; and the spasms extend to the very fingers. The breathing now becomes extremely laborious; the patient is restless; and at last is carried off, sometimes in the space of ten or twelve hours.

19. Such is the progress of spasmodic cholera, as it was observed by the writer in the years 1816 and 1817, in an intertropical climate, and as he then experienced it in his own person. About the same time other cases of a milder form occurred, and presented the characters described as constituting the bilious variety of the disease, with which the writer had also been formerly attacked in this country, in the end of September, 1815, — a season of unusual warmth, — when he was attended by his friend Mr. QUEADE. There can be no doubt that the first and third varieties of cholera chiefly differ in degree, and in the circumstance of the latter arising, in most cases, from the operation of causes of a more intense grade than those which induce the former. But as additional phenomena are developed in the latter variety, and other symptoms assume a different or modified character, and especially as a distinct method of cure is requisite to its removal, the propriety of distinguishing it as a separate form of the disease is manifest.

20. II. DIAGNOSIS. — This disease can be mistaken only for the pestilential cholera, or for poisoning by acrid substances. The diagnosis between this and the *pestilential* malady is fully pointed out in that article. It is often difficult to distinguish between the different varieties of *true cholera* (the pestilential disease which has been very generally viewed as a form of cholera being, in my opinion, very different in all its relations from this), and the disorder occasioned by irritating poisons. Dr. CHRISTISON, in his very able work on Poisons (p. 93.), has assigned the more rapid termination of poisoning, in fatal cases, as a ground of distinction. But he supposes that death from cholera occurs at a later period than it usually does: and, hence, this source of diagnosis cannot be much relied upon. Death from irritating poisons usually takes place within thirty-six hours, and sometimes within twelve hours; being seldom delayed beyond sixty hours; but the fatal issue in cholera is very rare, he considers, in less than three days. I believe, however, that, although death from the common cholera of this climate is rare, it more frequently occurs from twenty-four hours to eight and forty, than at a later period. Greater dependence is to be placed upon the appearance of the matters vomited, which are more frequently sanguinolent after irritating poisons than in cholera. But the

chief diagnostic sign is the sense of heat, acridity, or burning in the throat, descending in the course of the œsophagus to the stomach, which is so much complained of in poisoning, and precedes the vomiting. In cholera, when a similar sensation is felt, it is usually confined to the region of the stomach, and is consequent upon the vomiting.

21. The diagnosis between cholera and other diseases which resemble it the nearest is easy. It is distinguished from *colic*, by the frequency of the vomiting and purging, the spasms of the muscles of the extremities, and the greater acceleration of pulse; — from *diarrhœa*, by the vomiting and the spasms; and by the quickness of the pulse in the latter stage of cholera; — from *dysentery*, by the tenesmus, bloody stools, absence of the spasms of the extremities, and of the vomiting; or the occasional presence merely of this last symptom in that disease; — from *ileus*, by the appearance of the matters vomited, and the obstruction of the bowels constituting that malady; — and from *painters' colic*, by the absence, or occasional occurrence only, of vomiting; by the constipation, the paralytic signs, &c. characterising that disorder; and by the history of the case.

22. III. Causes and Pathological States. — The *remote causes* have been already noticed in connection with the symptoms and forms of the disease they occasion. *A.* As to the *morbid appearances*, they may be stated as generally being very slight in rapidly fatal cases, and consisting merely of irritation of the mucous surface of the duodenum, stomach, and small intestines; but without any change of structure. If death takes place at a more or less remote period, injection of the capillaries, with congestion, sometimes with ecchymosis, and enlargement of the mucous follicles, is observed more or less extensively — either in streaks or patches — in the inner surface of the digestive tube. In fatal cases of the third variety of the disease, the liver has been found congested, the gall-bladder and hepatic ducts filled with dark coloured inspissated bile, and the common ducts sometimes constricted or obstructed.

23. *B.* The *pathological state* constituting the disease, seems to consist of irritation of the mucous surface of the digestive tube, commencing in the duodenum, and extending in each direction — to the stomach, small intestines, and along the common duct, to the gall-bladder and liver, — with increased action of the muscular coats of these viscera, and determination of the circulating fluid to them. This irritation or morbid excitement, owing to the connections of the organic nerves supplying these parts, is propagated to the spinal nerves, by which the muscles of the abdomen and extremities are affected by painful and violent contractions; and it is chiefly owing to the exhaustion of the vital manifestations of the organic system of nerves, and to the frequent and profuse discharges, that a fatal issue takes place: the circulating organs, which are actuated by this system, being, in consequence, incapable any longer of performing their functions.

24. A question may arise as to whether the disease commences with the irritation of the mucous surface of the duodenum and adjoining portions of the digestive tube, or with determination of the circulation to the liver and adjoining viscera, and an irruption of bile, which has become more than usually irritating, owing to its retention in the biliary apparatus, or to its formation from redundant or noxious materials accumulated in the circulating fluid (see Blood, § 119. and 120.), during high ranges of temperature, and moist miasmal states of the air. It is not very material which of these phenomena is the first to occur: probably either may precede the other; and even, in some cases, that both may be nearly coetaneous. It is, however, most likely that the procession of morbid phenomena described above (§ 22.) obtains in the great majority of cases.

25. *C.* The different states of cholera may *terminate* differently from either of the ways already noticed (§ 10. 14. 18.): it may pass into inflammation of the stomach or of the intestines, or of both; it may also lapse into dysentery, or into a regular attack of gastric, bilious, remittent, or intermittent fever. The supervention of some of these diseases upon, or their association with, cholera, has been long since noticed by Morton and Torti; and, more recently, by Jackson, J. P. Frank, and Schmidtmann; and must be familiar to experienced practitioners, particularly in warm, moist, or miasmal climates. In many such instances, this mode of termination is to be imputed to the nature of the exciting causes, the constitution of the patient, and sometimes also to the premature arrest of the evacuations by opium, and the neglect, subsequently, of procuring the discharge of morbid secretions by purgatives, &c.

26. IV. Treatment. — Demulcents, diluents, and weak broths or soups, have been very generally given at the commencement of a choleric attack, particularly of its first or common form, since the time they were recommended by Sydenham. In slight cases, and at its beginning merely, this is as judicious treatment as can be adopted. But in the more severe seizures, and particularly if a delay of two or three hours has taken place in applying for or procuring medical aid, much more decided means should be resorted to. In such cases, it is no longer necessary to promote the evacuation of the offending matters, which have generally by this time been expelled. It is preferable, therefore, in these, and, indeed, under most circumstances — 1st, To allay the irritable state of the stomach, the spasms, and other urgent symptoms of the disease; 2d, To remove, by appropriate means, as blue pill, diluents, mucilaginous fluids, and deobstruent aperients and enemata, whatever morbid secretions may be retained or re-accumulated; 3d, To prevent the occurrence of inflammation of the digestive mucous surface, by sheathing the surface of the bowels from the irritating action of the morbid and accumulated secretions during their discharge; 4th, To support the powers of life when they appear to sink; and, 5th, To restore and promote the functions of the various emunctories.

27. *A. Opium*, generally in the form of pill, is the medicine most to be depended on for the accomplishment of the *first intention*, especially in mild cases of the first variety. From one to three grains of it may be taken at once; but, in more severe attacks, and in the second and third varieties, it is preferable at first to combine it with from ten to twenty grains of calomel, which, in

a large dose, is one of the most quickly efficacious means we possess of diminishing vascular irritation of the internal surface of the stomach and small intestines. When a large dose of these remedies has been given, a repetition may not even be required; but, in the severe states of the disease, it will be necessary to repeat it once or even twice, after an interval of from three to six hours, or even longer, according to the urgency of the case. If the attack require the exhibition of two or three such doses of calomel, little apprehension of its affecting the mouth should be entertained, as such a state of disease admits not of the retention of the whole of it; and, when it is necessary thus to repeat it, the biliary organs will derive benefit from it. If the first doses of opium and calomel be not retained, they should be immediately repeated. In plethoric or robust subjects, when the pulse is fully developed, and the spasms severe, especially in the *third* variety of the disorder, a full or moderate bleeding may be directed; but it should be performed early, and restricted to young or robust subjects. This practice was employed by Dr. J. Johnson in India; and subsequently adopted by numerous other practitioners, as well as by myself. I should, however, state, that I have prescribed it only for Europeans who had recently arrived in a warm climate; but natives, or acclimated Europeans, require a different treatment (§ 30, 31, and 32.). In slighter cases opium, if not too early exhibited, will be sufficient to cure the disease; and the instances must be few, in which its use, in some form or other, can be dispensed with. Its superiority to other medicines in cholera has been admitted by Linnæus (*Morbi Naut. Indiæ.* Ups. 1768.), Thomann (*Annalen ad* 1800.), Young (*On Opium, &c.* p. 36.), Quarin (*Animadversiones Pract.* pp. 204—207.), and by most recent writers. Reide (*View of Dis. of the Army*, p. 63.) advises it to be given in copious draughts of tepid diluents; Percival (*Essays*, vol. ii. p. 405.), in enemata; and Sydenham (*Opera*, p. 177. ed. Lug. Bat.), after diluents and demulcents had been freely given, and the offending matters removed. When, however, vomiting and purging have existed some time, more particularly in severe cases, opium ought to be immediately exhibited; but in order to secure the effect of it, or of calomel combined with it, the patient should now refrain from diluents, in order that the rejection of the medicines may not be risked by them; and should merely rinse his mouth frequently with some cooling beverage, swallowing only minute portions of it, at short intervals. Sydenham has very justly remarked, — and the importance of the observation has been acknowledged by Frank and Schmidtmann, — that when opium is given too early, much disorder of the bowels and abdominal organs, with more or less fever, continues afterwards to be complained of; evidently owing to the arrest of a salutary effort, and the retention of morbid secretions. But the second intention of cure (§ 26.), and the combination of calomel with the opium, have for their objects to prevent this result in cases where all the morbid secretions may not have been expelled before the opium has been administered.

28. It is not unusual to find, upon being called to a case of the disease, that aperients had been freely exhibited with the view of promoting the evacuation of the offending secretions. But this is a hazardous practice, and is often, as Sydenham has remarked respecting it, adding fuel to the fire: its propriety at a later period, when the vomiting and spasms have disappeared, will be admitted.

29. If the spasms, pain at the epigastrium, and internal heat, be severe, very warm fomentations, or the hot bath at about 100° or 102°, are of much service if used early in the attack. But neither these, nor blisters, nor sinapisms, are so instantly and perfectly remedial as the turpentine fomentation applied over the abdomen. (See *Art.* Cæcum, § 32.). Several authors have recommended the use of cold or iced fluids, with the view of allaying the heat complained of in the stomach. They deserve notice chiefly from being recommended by Aretæus (*Curat. Acut. Morb.* l. ii. ch. iv.), Cælius Aurelianus (p. 258.), Lienard (*Ergo Choleræ Morbo Frigidus Potus.* Paris, 1626.), Hoffmann (*De Cholera*, obs. v. Opp. iii. p. 173.), Cleghorn (*Diseases of Minorca*, p. 222.), Penada (*Osservazioni, &c., Weigel Ital. Bibl.* b. iv. st. 1. p. 134.), and Panzani (*Beschr. der Krank. von Istrien, &c.*). Bartholinus (*De Usu Nivis Med.* p. 141.) advises the application of ice over the epigastrium; and Birnstiel, cold vinegar to the same region. The nitric acid drink has been much employed in India in cases of cholera. A favourable account of it in this disease was published by Sir J. Macgrigor, in Duncan's *Annals* for 1802. And Mr. Hope has recently recommended it conjoined with opium, in the cholera of temperate climates.

30. When the severity or duration of the more urgent symptoms has occasioned feebleness of pulse, with cold skin, and other symptoms of exhaustion, restorative means are requisite. Ammonia, camphor, the æthers, brandy, Cayenne pepper, the various aromatics and spices, are now the most serviceable medicines, and should be given frequently, and in moderate doses, variously combined, and generally with small quantities of opium. Although at an earlier stage it was necessary to prescribe opium in a large dose, yet at this period very small quantities only ought to be given, particularly if exhibited frequently. Any of the following will be now of advantage: —

No. 120. ℞ Aq. Anethi ℥j.; Magnes. Carbon. ℈j.; Spirit. Ammon. Arom. ♏xxvj.; Pulv. Capsici gr. iij.; Tinct. Opii Comp. (F. 729.) ♏x.; Confect. Arom. gr. vij. M. Fiat Haustus, secundis horis capiendus.

No. 121. ℞ Aq. Menth. Virid. ʒx.; Ammon. Carbon. gr. v.; Magnes. Calcinat. ʒss.; Tinct. Capsici An. ♏xij.; Spirit. Pimentæ ʒj.; Tinct. Opii Comp. ♏xij.; Olei Cinnam. ♏j. M. Fiat Haustus.

No. 122. ℞ Infus. Caryoph. ʒx.; Magn. Calcin. ℈j.; Tinct. Cardamom. Comp. ʒj.; Tinct. Opii Camphor. (F. 728.) ʒj.; Syrup. Zingiberis ʒj. M. Fiat Haustus.

31. In this stage of the disease, the application of sinapisms or blisters to the epigastrium, as directed by Celsus (l. iv. ch. xi.), Morelli (*Nuovo Giornale di Milano*, 1792.), and Aaskow (*Acta Reg. Soc. Méd. Haun.* i. p. 154.); of stimulating and irritating frictions of the surface, as advised by Aretæus (*Cur. Acut. Morb.* l. ii. ch. iv.), Cælius Aurelianus (p. 257.), and Alexander Tralles (l. v. ch. vi.), and of warm analeptic and aromatic epithems and embrocations, as prescribed by Morton and Quarin (*Animad. Pract.* p. 206.), may be resorted to. In the third *variety* of cholera, — which differs

from the first chiefly as to severity and the more prolonged obstruction to the flow of bile in its early stages, or throughout its course in fatal cases;—in addition to the means already stated (§ 30.), the external measures now mentioned may be employed; but they are much less efficacious than the embrocation noticed above (§ 29.). One of our principal objects in this state of the disease is to procure a discharge of bile into the intestines. Large doses of calomel, with opium and camphor, are the internal remedies most to be depended upon for the attaining of this end. But, if the energies of the frame begin to sink before it be obtained, it will be necessary to have recourse to diffusive stimulants in order to counteract the depression: at this period the calomel either may be left off, if a sufficient quantity has been taken, or may be combined with full doses of ammonia or camphor; the stimulants already prescribed (§ 30.), or warm brandy and water, being also given at short intervals, or in larger quantities. The *second* variety requires the measures now stated, with the addition of purgative and emollient enemata. If the flatulence be urgent, F. 135. 150. will be productive of immediate relief.

32. The natives of warm climates, or Europeans acclimated in them, require from the beginning, that the calomel should be combined as now advised; and that aromatics, antispasmodics, and anodynes, be given early in the disease. The large quantities of hot spices usually employed by these classes of persons, as well as the nature of the attack resulting from the constitution, natural and acquired, of those affected, render it necessary to prescribe aromatics and hot spices, especially Cayenne pepper, in large proportions, in conjunction with opium, camphor, &c. and to have recourse to the external means already noticed, almost from the commencement of the attack. Afterwards when urgent disorder has subsided, calomel, or blue pill, with aromatics, followed by warm stomachic aperients, and by purgative and antispasmodic enemata, will be required.

33. *B.* Having relieved the more urgent symptoms, whether of violent irritation or of consequent exhaustion, and having allowed some time to elapse in order that the viscera may recover their functions, it will be necessary to promote the discharge of the secretions which may have accumulated during the calm which had been procured, particularly when the inordinate action is followed by complete torpor of the bowels. In cases where calomel had been freely exhibited, mild stomachic aperients will be all that is necessary; but they should be given with caution, and at a time when there appears no risk of re-exciting the choleric attack, which may be readily done by the too early exhibition of purgatives. It will therefore, at first, be better to trust chiefly to enemata; to prescribe the mildest aperients only, and when they are absolutely required; and to administer chiefly mucilaginous fluids, &c. If calomel have not been previously given, a moderate dose, either of it or blue pill, at bed-time, will be even now necessary; and the latter may be repeated every third night, an aperient draught, or a dose of castor oil, being taken on the mornings following, for some time subsequently, until the alvine functions assume a healthy state. But if the stomach still remain irritable, it will be preferable to prescribe merely a blue pill, or the hydr. cum creta, at bed-time, and employ enemata.

34. *C.* If, during the progress of disease, or when the urgent symptoms have somewhat subsided, the pulse continues frequent, sharp, or constricted, with tenderness at the epigastrium, a furred tongue, great thirst, nausea, and retchings upon substances being swallowed, and general uneasiness, we should conclude that inflammation of the stomach and upper part of the intestinal tube has come on. In this case, from twelve to twenty-four leeches should be placed upon the epigastrium, and afterwards a succession of warm poultices, the last of which should be followed by the terebinthinate fomentation already noticed. In some cases, it will be necessary, from the severity of this consecutive disease, and the patient's habit of body, to bleed from the arm, previously to applying leeches. In cases where the fomentation is not employed, sinapisms or blisters may be directed, but not until depletion has been carried as far as may be considered either necessary or judicious; and small doses either of hydrarg. cum creta, with magnesia or sub-carbon. of soda, may be given every four or five hours; or of nitrate of potash, and almond emulsion, or any other demulcent substance, with the frequent use of enemata. The termination of cholera in gastric, bilious, remittent, and intermittent fever, or in dysentery, and the circumstances to which I have imputed this occurrence (§ 18. 25.) ought not to be overlooked, but should influence our practice both at the commencement and during the course of the attack. When it has passed into these diseases, it must necessarily be treated according to the new form it has assumed.

35. An attack of cholera soon occasions great exhaustion; and sometimes so great sinking, that even fatal syncope has occurred from allowing the patient to remain too long on the night-chair, or suddenly to assume the erect posture. In severe cases, the patient must be kept in a horizontal position; and besides the medical treatment already prescribed in this state of the disease, mild demulcent soups, beef tea, chicken broth, jellies, and sago or arrow-root, with wine, may be given him. In cases of this description, the exhibition of aperients by the mouth must not be ventured on during convalescence, at least not for several days; and even then with circumspection, and in conjunction with stimulants or tonics. We must endeavour to regulate the secretions by gentle alteratives, and to procure their discharge by enemata. During convalescence from cholera, strict attention should be paid to the state of the digestive functions. The patient ought to abstain from all irritating and indigestible kinds of food, and heating liquors, and from overloading the stomach. Change of air, gentle travelling, and moderate exercise, are extremely conducive to perfect recovery.

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Choleric Fever of Infants. *Cholera of Children*, *Cholera Infantum*, Rush and Dewees. — Classif. III. Class, I. Order (*Author*).

1. Defin. *Vomiting and purging, with fever generally of a remittent type, irregular spasmodic convulsions, and rapid emaciation, attacking infants and children.*

2. I. History, &c. — This disease attacks children during the summer and autumnal months, and sometimes as early as April and May. It occurs at any period, from the age of two or three weeks to that of several years. After this age, the same causes which produce it occasion, according to their combinations and the state of predisposition of the patient, either fever of some kind, or cholera, or inflammation of the stomach and bowels.

3. *A. Causes.* — It is often independent of any disorder from dentition, as shown by the age at which it frequently occurs, and the seasons to which it is almost entirely limited. That it is not always caused by acid, acrid, or stale fruit, and indigestible substances, has been proved by examination of the history of numerous cases; although, doubtless, this cause, as well as dentition, will contribute to its occurrence. It is certainly not owing to worms, as far as my own observation may be depended upon; besides, it is often met with at an age anterior to that at which worms form in the intestinal canal; and, in fatal cases, worms are not more frequently expelled from the bowels than in many other diseases, as remarked by Dr. Rush. But it is evidently owing to the influence of high ranges of atmospheric temperature acting upon malarious localities, and upon close, low, thickly inhabited, and imperfectly cleansed and ventilated streets, closes, and lanes, assisted by the above causes, particularly by premature weaning, want of the mother's milk, errors in diet and clothing, &c. That it originates chiefly in an atmosphere loaded with putrid or mephitic effluvia is shown by its occurrence among children thus circumstanced; by its frequency during the seasons already specified in temperate climates, particularly in localities which possess the materials or sources of such exhalations; by the periods of its prevalence among children in warm climates, and in America; and by its appearance at the same time with the cholera of adults, and with remittent and intermittent fevers. This origin is further shown by the circumstance of its being generally accompanied with fever, frequently of a remittent type. In some very unhealthy climates within the tropics, the children born of European parents seldom reach two or three years without having an attack; and, in some places, scarcely one will survive this age, if allowed to remain in them, — this disease cutting them off before they reach a year or two, and often when they are only two or three weeks old. According to Dr. Dewees, it is one of the most fatal diseases of children in the large towns of the United States; and it is certainly not an infrequent malady of the same class of patients in this metropolis.

4. *B. Symptoms.* — The choleric fever of infants sometimes begins with diarrhœa; but more commonly with violent vomiting and purging, which are soon followed by fever. The matters vomited are usually yellowish or greenish yellow; and the dejections are slimy, watery, sometimes offensive, with a sour or putrid odour, and tinged with blood. The natural fæces are generally retained, although small lumps are occasionally passed. In some cases, at an advanced stage, they consist nearly altogether of water, or of substances recently taken. The muscles are irregularly and spasmodically convulsed or contracted; the child is much pained, is restless, and throws the head backwards and forwards, the lower limbs being forcibly drawn upwards. Thirst is intense and unquenchable, cold fluids being eagerly desired. The pulse is small, quick, and feeble. Determination to the brain is soon sympathetically excited, as evinced by increased temperature of the head, and a tendency to stupor. The extremities are commonly colder than usual; and the abdomen is hot. All the febrile symptoms are exacerbated in the evening, and occasionally attended by delirium during the night. The eyes are languid and hollow, are half-closed during sleep; the countenance soon becomes contracted and collapsed, and the cutaneous surface insensible. In the most acute cases, death may occur in twenty-four hours; but the disease is most frequently of considerable duration, presenting occasional remissions. Its violence is much lessened by cool dry states of the air, and increased by a close moist atmosphere. In some cases the vomitings soon abate, and it seems to pass into dysentery, or chronic diarrhœa, either with or without tenesmus, tormina, and occasionally with prolapsus ani. It often runs on several weeks with temporary exacerbations and remissions; occasioning remarkable emaciation, and, lastly, flatulent distension of the abdomen, and aphthæ on the tongue, lips, &c.

5. *C.* The *Prognosis* will depend upon the effect of the remedies employed, particularly on the state of the discharges. If these become more abundant, of a darker colour, and more bilious; and if the irritability of the stomach, the cerebral disturbance, and the fever, subside; we may expect a *favourable* issue. On the contrary, increase of restlessness, of the spasms or convulsive movements, and of the cerebral symptoms, rapid emaciation, small thready pulse, cold damp surface, watery pink-coloured stools, constant puking, and especially flatulent distension of the abdomen, and the appearance of aphthæ about the mouth, continued stupor, with the eyes half open, and occasional convulsions, are very *unfavourable* signs. A favourable issue should not be expected with any confidence until healthy bile appears in the stools, and the evacuations assume a natural character.

6. *D.* In *fatal cases*, the digestive mucous membrane is commonly found more or less inflamed, thickened, softened, its submucous surface infiltrated, and rarely ulcerated or excoriated. The mucous follicles, especially those of the small and large intestines, are enlarged or ulcerated;

the mesenteric glands are often enlarged; the liver is sometimes darker, and generally much larger, than natural; the gall-bladder is occasionally filled with bile; and the spleen is manifestly congested. In a few instances, the intestines have been found more remarkably inflamed, and adherent by means of exudations of lymph on their peritoneal surfaces. In the more protracted cases, effusions of serum are found within the cranium; but, in recent cases, the brain presents little or no morbid appearances beyond slight congestion.

7. *E. Its nature.* — The symptoms, and the appearances after death, clearly show that this disease consists of inflammatory irritation, often rapidly passing into inflammation of the greater part of the mucous surface of the stomach, and of the small and large intestines; frequently accompanied with depressed vital energy of the frame, congestion of the liver, and a morbid state of the abdominal secretions, and occasioning sympathetic disorder either of the functions or of the substance of the brain and its membranes.

8. II. TREATMENT. — At the commencement of the disease, demulcents may be administered. Dr. RUSH recommends an ipecacuanha emetic; but Dr. DEWEES disapproves of emetics, — an opinion which is agreeable to my experience. I have usually first had recourse, in the slighter cases, either to hydrarg. cum creta or calomel, in frequent doses, and combined with magnesia or soda; or to nitrate of potash with the sub-carbonate of soda, in demulcents; and to the application of leeches on the epigastrium, whenever tenderness of this region could be detected. After a few of these powders have been taken, a dose of calomel, sometimes with a grain of James's powder, has been given at bed-time, and castor oil the following morning: at the same time, oleaginous glysters have been administered, and, as the symptoms abated, those of an emollient kind employed. If the patient be not very young, a few drops of tinct. opii, or a little syrup of poppies, may generally be added to the injection. The warm bath, or the semicupium, should never be omitted in the treatment of this disease, the surface being well rubbed with a coarse towel upon coming out of the bath, and the child afterwards placed in warm blankets. These means, if early resorted to, will generally succeed in the less severe cases occurring in temperate climates. But, in the more intense states of the malady, medicines given by the mouth will not be retained; and such a dose of opium as will not be rejected, may be injurious. In these, it will be preferable to commence with the application of leeches to the epigastrium; and to endeavour to procure more healthy evacuations, and a discharge of bile downwards, by repeated injections, consisting of a solution of common salt (about two or three tea-spoonfuls) in warm water. The frequency of the stools ought not to prevent the administration of the injection; which will generally relieve the vomiting and other symptoms as soon as bilious or fæcal evacuations are procured.

9. When the disease appears to be brought on by improper ingesta, the vomiting may be promoted by diluents. But the object should be to quiet the stomach as soon as possible. For this purpose Dr. DEWEES recommends, for very young children, as well as for those who are older, a tea-spoonful of strong coffee, without sugar or milk, every fifteen minutes. Of this treatment I have had no experience. In cases where the more bulky medicines are not retained, the plan of giving minute doses of calomel, adopted by Dr. DEWEES, may be followed. He directs a quarter of a grain of calomel intimately mixed with half a grain or a grain of sugar, to be placed dry, every hour, upon the child's tongue, until the stools become more copious, less frequent, and of a dark green colour. When this change is effected, the powders are to be given less frequently. After the bowels have been well evacuated, he prescribes an injection in the evening, with a few drops of laudanum, according to the age of the child; and if the disorder is not much abated, he recommences with the calomel powders as above, on the following morning, repeating the injection at night. I have never tried this practice, having found the means recommended in the preceding paragraph (§ 8.), with those about to be noticed, generally successful.

10. In the more acute cases, especially when fever is early developed, and much heat of the abdomen or of the head is complained of, the disease should be viewed as being entirely dependent upon inflammation of the mucous surface of the digestive tube, and affecting the brain sympathetically. In these, leeches must be placed upon the epigastrium, or behind the ears; if applied to the former situation, a succession of warm poultices should follow them, a full dose of calomel, intimately mixed with a little sugar, be exhibited, and, soon afterwards, an oleaginous injection (olive oil or castor oil, or both, in gruel, strained mutton broth, or any other demulcent vehicle) thrown up. If these measures fail of producing the advantage expected, the back, loins, or insides of the thighs, should be rubbed twice or thrice daily with either of the *liniments* F. 296. 300. 311., particularly upon coming out of the warm-bath, or semicupium, which ought to be employed once or twice daily, and rendered more efficient by adding salt or mustard, or both, to it. The application of blisters for two, three, or four hours, and re-application of them for an equally short time in another place, may be subsequently had recourse to, when the preceding measures do not answer the purpose for which they were directed. In the more severe cases, particularly when the motions are bloody, a mucilaginous draught, with castor oil and two or three drops of laudanum, may be given; and, if it be not retained, an enema, consisting of the same ingredients, may be administered, or any of the enemata contained in the Appendix suited to the circumstances of the case, and proportioned to the age of the patient.

11. In the advanced stage of the disease, especially when it passes into a dysenteric state, and when the exhaustion is great, and the stools are offensive, small doses of the chlorate of lime, or of potash, in an aromatic water, or in mucilaginous draughts or injections, will be very serviceable. In this chronic period, when the disorder lapses into the form of diarrhœa, proceeding from chronic inflammation of the intestinal mucous surface, the following powders may be given alternately with the chlorates, or either before or after they have been tried: —

No. 123. ℞ Hydrarg. cum Creta gr. j.; Magn. Ustæ gr. iij.; Gum. Acaciæ et Sacch. Albi, āā gr. v.; Tinct.

Opii Comp. ♏j—ij. Fiat Pulvis, quovis in vehiculo idoneo sumendus, bis terve in die.

No. 124. ℞ Sodæ Sub-carbon. gr. iv.; Pulv. Acaciæ gr. xij.; Aquæ Cinnam. ʒ vj.; Syrup. Papaveris ʒ ss. M. Fiat Haustus.

12. It will often be of the utmost service, even at this advanced stage, to give a full dose of calomel, and, if there still be fever, a grain of James's powder, at bed-time; from half a drachm to a drachm of the spirits of turpentine occasionally, with an equal quantity of castor oil being taken on the following morning in some aromatic water, or in milk: or, from five to twenty-five drops of the spirits may be prescribed three or four times daily in any suitable vehicle. During this period of the complaint, small quantities of rhubarb, magnesia, and ginger; lime-water with milk, the preparations of columba with soda, those of catechu with chalk, the hydrarg. cum creta with Dover's powder, the decoction of pomegranate bark, or small doses of the sulphates of iron and of potash, may severally be employed according to circumstances. If pain be still complained of, small doses of the compound tincture of opium, or of Dover's powder, or of syrup of poppies, become absolutely necessary. In this chronic state of the disease, the sub-borate of soda given internally, either alone, or with an equal quantity of supertartrate of potash, has proved extremely useful in my practice at the Childrens' Infirmary; either of the liniments, No. 296. 300. 311., being rubbed daily over the abdomen, and a flannel roller afterwards placed around it. In this stage of disorder, Dr. Chapman recommends the following: —

No. 125. ℞ Ferri Sulphatis gr. ij.; Acidi Sulphur. gtt. x.; Sacchar. Albi ʒ j.; Aq. Fontan. ℥j. M. Capiat ʒ j. ter quaterve quotidiè.

13. The febrile nature of the disease, and its evident connection with inflammation of the mucous surface of the stomach and bowels ought not to be overlooked. In its early stage, therefore, cooling febrifuge medicine and beverages may be allowed the child, in order to assuage the thirst. With this view the liquor ammon. acet. with nitre, and spirit. æther. nit., may be given, with aq. fœniculi, at short intervals; and, in the more advanced stage, when the irritability of the stomach has subsided, small doses of the sulphate of quinine, either in syrup or in compound infusion of roses; or the infusion of cinchona, with a few drops of liquor potassæ, or of the sub-carbonate, may be directed. When the stomach will retain it, this infusion, with liquor ammon. acet., very small quantities of nitrate of potash, and the spirit. æther. nit., has proved beneficial.

14. *Regimenal and Prophylactic Treatment.* — *a.* When the disease occurs, as is most commonly the case, in infants under a twelvemonth, the diet should consist, at the commencement of the attack, exclusively of the mother's milk, or when it has been recently weaned, a healthy wet-nurse should be procured. If, however, the child will not take the breast, small quantities of diluted sweetened milk may be given, or thin rice or barley-water, with some gum added to it. Besides these, soda water, marsh-mallow tea, and the water poured off an infusion of toasted oatmeal, or oat-cakes, may be also tried. In the latter stages of the complaint, the usual farinaceous aliments may be allowed. Dr. Rush attributes much importance to the moderate use of salted provisions at this period, and of port wine; and I have had occasion to know, that both of these are often extremely beneficial when properly restricted. I believe that the want of a sufficient quantity of salt in the food of children, in climates and states of the air requiring this condiment, is often concerned in the causation of the disease. For no malady is change of air more necessary than for this. The child should be removed from the crowded town to the open country; an elevated, dry, but not bleak, situation being selected. Removal to the sea-side is also very beneficial; or, when a more complete change cannot be enjoyed, a close, low situation may be exchanged, even for a time, for one that is more open and elevated.

15. *b.* The *prophylactic* measures may be briefly stated to consist of allowing the infant a healthy breast of milk till it is a year old; of wearing flannel next the skin, and keeping the lower extremities warm; of regulating the diet, and avoiding excess in fruit, and the use of unripe, over-ripe, or stale fruit; and of attending to the state of the gums during the period of dentition.

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CHOREA. Syn. *Chorea Sancti Viti* (from χορέα a dance with singing); *Saltus Viti*, *Chorea Sti. Modesti*, *Choreomania*, *Ballismus*, *Orchestromania*, *Epilepsia Saltatoria*, Auct. Var. *Chorée*, Fr. *Der St. Veitstanz*, Ger.

Classif. 2. *Class*, Nervous Diseases; 3. *Order*, Spasmodic Disorders (*Cullen*). 4. *Class*, Nervous Affections; 3. *Order*, Affecting the Muscles (*Good*). II. Class, III. Order (*Author*, in *Preface*).

1. Defin. *Tremulous, irregular, involuntary, and ludicrous motions of the muscles of voluntary motion, more marked on one side than the other, without pain, occurring in both sexes, more frequently in the female, and chiefly between eight and fifteen years of age.*

2. This disease was formerly called the Dance of St. Guy by the French, and of St. Weit by the Germans, from the circumstance of it being so prevalent in Swabia, and other parts of Germany, during the fifteenth and sixteenth centuries, that patients crowded to a chapel near Ulm, dedicated to this saint, who had, by the aid of the priests, obtained great celebrity in its cure. It appears to have been known to the ancients; for the Scelotyrbe of Galen very nearly resembles it. The earliest writers, since the revival of letters, who noticed this affection are, Plater, Horstius, and Sennert, under the name of Chorea Sti. Viti. In 1560, Bairo, physician to the Duke of Savoy, mentioned it under the name of "*Indispositio Saltuosa Membrorum.*" But Sydenham was the first author who accurately described it.

3. I. History, &c. *A. Symptoms.* — The pathognomonic characters of chorea consist in disordered movements of parts actuated by the voluntary order of nerves; the functions of volition and of muscular action being deranged analogously to the manifestations of the mind in mental alienation. The disordered movements vary very considerably, in respect of the number of parts affected, and of the intensity of the affection: hence it may be

partial or general, slight or severe. It is more frequently partial than general, and is very often confined to the muscles of one side of the body. The description by Sydenham has been copied with little alteration by many authors; and, although extremely accurate in respect of some states of the disease, it by no means embraces all the varieties: that by Dr. Hamilton is, upon the whole, the best, particularly as respects its fully developed form.

4. This affection is often *preceded* by more or less marked disorder of the organic functions: the appetite is variable, the digestion imperfect, the bowels costive, the abdomen tumid, and the vivacity and physical activity diminished. To these are frequently added timidity, fretfulness, desire of solitude, sighing, palpitations, concealed mental affection, &c. These symptoms of disordered health are followed by slight, irregular, and involuntary twitchings of the muscles, particularly those of the face. These motions increase, assume the form of irregular clonic and continued convulsions, and are often attended by increased hardness, or tumefaction, of the lower regions of the abdomen, and constipation. Owing to the irregular convulsive motions of the face, jaw, head, and neck, of the trunk and extremities, and from the circumstance of these motions taking place at different times, the patient has a jumping, starting, or palsied walk, and cannot perform the usual occupations of the extremities with the steadiness and regularity of health. The characteristic motions vary in degree; but they are always present during the continuance of the disease, excepting while the patient is asleep, when, in most instances, they altogether cease.

5. Different muscles are sometimes successively affected; but those first convulsed still continue so until the termination of the disease. When the affection is fully formed, articulation is impeded, but seldom completely suspended. Deglutition is often difficult; the eyes lose their lustre and expression; the countenance becomes pale, languid, vacant, and, in the severest and most protracted cases, conveys the idea of imbecility, or even of fatuity. In the course of disorder, the muscles seem much more soft and flaccid than natural, and emaciation takes place: vertigo and headach are often complained of. The pulse is a little accelerated; the bowels are always constipated, and the urine is usually pale and copious. The tongue and gums are pale; the former being occasionally protruded, irregularly and spasmodically. In some of the severest cases the mouth is variously twisted, and a drivelling of saliva takes place from it: the eyes are distorted, or rolled in various directions, and the sight is occasionally defective. The disposition and temper are unstable or irritable; the mind is often harassed by various concealed mental impressions and ideas; and the emotions or desires are variously excited, without any sufficient or apparent cause. In some cases, deglutition is much impeded, and fluids are forcibly thrown up from the pharynx in attempts at swallowing them. Bernt and Frank state, that the urine and fæces are occasionally passed involuntarily during the height of an attack; but this rarely occurs in simple chorea. There is seldom any pain complained of, and, although the movements cease during sleep, yet the rest is often disturbed.

6. Such is the state of the fully formed disease; but it presents endless varieties, sometimes insensibly lapsing into hysteria, in other cases approaching to paralysis; now scarcely to be distinguished from convulsions; in one instance resembling tarantulism, and in another being closely allied to paralysis tremens. In some cases, the muscles of the face and neck are more affected than those of other parts; whilst in others, those either of the upper or of the lower extremities, or of one limb only, are most convulsed.

7. *B. Duration, complications, and terminations.* — *a.* The *duration* of this affection under treatment is various — from two or three weeks to several months: the most common duration being from one to two months. The shortest period of treatment, in the cases which have occurred to me, was eleven days. Relapses are, however, not infrequent. I have seen the affection to return thrice in the same patient. *b.* Chorea is very frequently *associated* with other disorders: in females with chlorosis, retention or suppression of the menses, anæmia, hysteria; and, in males, with rheumatism, with paralysis, disease of the head, and dropsical effusions in the serous cavities. *c.* It also not infrequently *terminates* in these, and in convulsions, epilepsy, anæmia, dropsy, palsy, hydrocephalus, and complete idiotcy. A return, however, to health is its most common issue. In a case related by Dr. Elliotson, it terminated in apoplexy; and Dr. Brown refers to three instances in his practice, where it terminated in violent convulsions, with cerebral symptoms, coma, and death.

8. Its *complication* with rheumatism, rheumatic pericarditis, and disease of the membranes of the spine, was first demonstrated by the writer, in a case, the *post mortem* inspection of which is detailed in the fifteenth volume of the London Medical Repository; the connection having been subsequently confirmed by Dr. Prichard and by Dr. Roeser, who have met with similar cases. The association of chorea with hysteria is very frequent about the period of puberty; and when the former occurs, after this term. Indeed, the majority of cases exhibiting choreal symptoms at or subsequently to the epoch of puberty in the female, partake more or less of the hysterical character — in many instances to the extent of appearing as a modified form of hysteria, rather than as chorea: and, upon strict inquiry, some irregularity is generally detected in the accession or subsequent occurrences of the catamenia. Females who are attacked by, or have been subject to, chorea anterior to the period of puberty, occasionally experience at this age retention or postponement of the catamenial discharge; or, if this secretion at all appears, it is scanty and at irregular intervals. Both the chorea and disorder of the catamenia evidently depend upon a similar condition of the vital manifestations of the organic nervous system, and chylopoietic viscera. The following procession of morbid phenomena is not uncommon: chorea with defective action of the digestive, assimilating, and secreting functions, and torpor of the liver; at a subsequent term, protracted catamenia, or scanty and irregular appearance of the secretion, occasionally with various hysterical affections, seldom amounting to a complete fit of the hysteria; and, lastly, when the catamenia become established, the hysterical af-

fection is sometimes more fully pronounced; and, with the regular establishment of the uterine functions, the chorea disappears. Dr. WHITE relates the case of a lady, aged 42, who appears to have been the subject of chorea of an irregular or rather doubtful character, and liable to attacks of hysteria. In this case, which has been too readily admitted by Dr. GOOD as one of chorea, the menstrual discharge is reported to have been regular; but it is probable that in this, as many other instances of diseases occurring in females, a more strict inquiry would have detected some derangement in the uterine functions.

9. *C.* The *appearances found* on dissection of fatal cases are rather referrible to the complications than to the disease itself. In general, the body is somewhat emaciated, and the muscles soft, flaccid and pale. The stomach, bowels, and associated viscera present only contingent lesions: they are, however, often flaccid and pale, sometimes with a slight effusion of serum in the peritoneal cavity. In a few instances, signs of irritation of the uterus have been observed. Dr. HAWKINS, found, in a case he examined, besides increased vascularity of the uterus, earthy concretions in the pancreas, omentum, and mesentery, with tubercles in the lungs. In the fatal cases recorded by Dr. PRICHARD, Dr. ROESER, and myself, adhesions of the opposite surface of the pericardium, with effusion of serum in it, and slight effusion into the pleura, were observed. In a case which occurred in my practice, the surface of the heart was covered in parts with coagulable lymph; its cavities were much enlarged, and their walls thin, pale, and flabby, resembling the muscles of white-fleshed animals. M. DESPERRIERE met with effusion of serum into the pericardium. SOEMMERING states, that he detected the results of inflammatory action in the membranes of the brain; and several authors have made mention of small ossific deposits in the arachnoid of the dura mater. Dr. BROWN, in the only one, of the three cases which terminated with convulsions and coma, that he had the opportunity of examining, found congestion of the vessels of the brain, with slight serous effusion between the membranes, and in the ventricles, and a *calcareous concretion* of a cubic form, and the size of half an inch, in each side, in the medullary substance of the left hemisphere, — the convulsive movements having been chiefly on the left side of the body. Dr. COXE found the vessels of the brain congested, and twelve ounces of serum in its ventricles: Dr. WILLAN, also, in two instances, observed several ounces of serum in the ventricles of the brain. Dr. PATTERSON describes appearances of the membranes, consisting of vascular congestion with effusion of serum, and states, that a patient cured of the disease very soon died of hydrocephalus. M. SERRES found, in one instance, a fatty tumour resting on the tubercula quadrigemina; in another, appearances of increased vascularity, with sanguineous effusion; and in two others, inflammation of this part of the brain. He further states, that, in experiments on living animals, he remarked injury of these parts to produce phenomena resembling chorea; but he at the same time admits that he has sometimes met with cases of chorea, in which no diseased appearances in the brain could be detected after death. In a case which occurred to me in 1819, complicated or rather alternating with rheumatism, with metastasis of this disease to the heart, and subsequently to the membranes of the spinal chord, inflammatory appearances, with coagulable lymph, and an effusion of turbid serum, were found through nearly the whole extent of these membranes, the patient having died in a state of universal paralysis. Changes in the spinal membranes similar to those described by me were observed in the four very interesting cases detailed by Dr. PRICHARD: in these latter, also, more or less congestion of the vessels, with effusion of serum between the membranes, and in the ventricles of the brain, was remarked. Dr. ALIPRANDI has also detailed a case, in which morbid appearances similar to those described by myself and Dr. PRICHARD were found in the spinal canal.

10. II. DIAGNOSIS and PROGNOSIS. — *a.* This disease, in its ordinary states, may be distinguished from other affections of a similar kind by the permanency, the clonic, and the partly voluntary nature of the movements, and their cessation during sleep. In *convulsions*, the movements, however irregular, and in other respects resembling chorea, are not continued, are not even partially under the influence of the will, and are of the most violent or tonic kind. The disease to which the name chorea was originally given approached nearer this latter description, but presented no uniform character, — various nervous disorders, very different from each other in many of their essential symptoms and pathological states, as the nervous affections resulting from the bites of the tarantula or other insects, irregular forms of hysteria, and convulsion, receiving this appellation; and, even at present, many irregular forms of convulsion, particularly those of a clonic kind, are often confounded with chorea. The only other disorder for which it may be mistaken is *paralysis tremens*, which occurs at a later period of life than chorea, is generally more limited to a single limb or part of the body, the movements being more of a tremulous than of a spasmodic kind, and to a much less extent; and not partaking of the starting, jumping, twitching, and ludicrous character possessed by those of chorea.

11. *b.* The *Prognosis* in the simple or uncomplicated state of chorea is generally favourable. But when it comes on after attacks of rheumatism, or in conjunction with this disease; if it follow the disappearance of the acute or chronic exanthemata and eruptions, or arises from injuries of the head, or from manustupration; if it be associated with epileptic convulsions, or with more or less complete paralysis of some limb or part; and if signs of anæmia, chlorosis, dropsical effusion, affection of the functions of the brain, or idiotcy, manifest themselves, an unfavourable, or at least a cautious, opinion of the result should be offered. It would seem that the disease is more severe or more frequently complicated in large cities, or in some places, than in others, for the very different results of practice cannot otherwise be well explained. Dr. PARR states, that in about sixty cases, in which the treatment very generally employed by other physicians was resorted to, all recovered, and only two had relapses. I have met with three or four fatal cases; Dr. PRICHARD has recorded four; Dr. BROWN refers to three in his practice; and I have occa-

sion to know that a similar issue is not rare in cases occurring both in London and in Paris.

12. III. Causes. — *A. Predisposing causes.* Chorea is much more frequent in the female than in the male sex. According to the experience of Heberden, Thilenius, J. Frank, Reeves, Manson, Elliotson, and myself, three of the former to one of the latter are affected by it. The most common period of life is from seven years to fifteen — from second dentition to puberty; but no age is entirely exempt from it. M. Bouteille met with it in a lady of 80, complicated with hemiplegia; Dr. Powell and Dr. Maton, in females of 70; Dr. Crampton, in a female upwards of 40. I have seen it in a man upwards of 50; and cases sometimes occur as early as five or six years. The nervous temperament, and great sensibility of the nervous system; hereditary disposition; constitutional debility from whatever cause, either from original conformation, or from bad or deficient nourishment in early infancy, particularly an insufficient supply from the mother or nurse's breast, or total deprivation of this nutriment; effeminate education, and premature exercise of the mental powers; precocious excitement of the desires and affections; debility of the digestive and assimilative viscera; neglected state of the bowels, leading to accumulations of deranged secretions in the prima via; torpid function of the liver, and other secreting and assimilating organs; cold and moist climates; confinement or sedentary occupations in low, unhealthy, or crowded places; low or innutritious diet, especially vegetable food; impure miasmal air; want of personal cleanliness; and the ricketty, scrofulous, and rheumatic diathesis; constitute the chief predisposing causes of the disease.

13. *B. Exciting causes.* — These are not often readily ascertained. The most common are the irritation of worms or of morbid matters accumulated in the bowels (Stoll, Baldinger, Wendt), and fright. Dr. Reeves and Mr. Bedingfield state, that the great majority of cases which they treated was attributed to fright; and a nearly similar statement is made by Stoll and Ecker. Injuries affecting some part of the nervous system especially, as falls upon the head and back (Geash, Frank); the improper employment of lead, mercury, &c. (De Haen); suppressed eruptions, discharges, &c. (Thilenius, Darwin, and Wendt), particularly tinea capitis, itch, herpes, perspiration of the feet, &c.; metastasis, or extension of rheumatism to the membranes of the spinal chord (Ploucquet, Copland, Prichard, &c.); previous disease, especially the eruptive fevers, epilepsy, hysteria, and mental disorder (Sallaba); second dentition; suppressed discharges; anxiety, the dread of impending occurrences, concealed mental impressions and moral emotions, and the influence of imagination (Darwin, Haygarth), particularly morbidly exercised imagination in connection with sexual desire; frequently excited jealousy and envy; masturbation, and retained, or difficult, or suppressed menstruation, particularly if occasioned by this practice (Richter, &c.), and cold long endured, — are all occasionally exciting causes of the disease.

14. IV. Nature of the Disease. — Opinions as to the pathological state originating chorea have been extremely various. Sydenham considered it as a species of convulsion, occasioned by a humour affecting the nerves. Sauvages, Cullen, and many others, ascribed it to general debility, attended by unusual mobility of the system; and several writers, among whom I may notice Bouteille, Clutterbuck, Serres, Lisfranc, &c., to inflammatory action of some part of the cerebro-spinal axis; thus viewing it as intimately related to paralysis. Dr. Hamilton attributed it to disordered functions of the bowels, affecting the muscular actions sympathetically; and a very large number of writers, to debility deranging principally the nervous and muscular systems; the torpid states of the organic functions being a related or associated manifestation of disorder.

15. *A.* The exact *seat*, as well as nature, of the disease can be inferred with accuracy only from attentive observation of the causes in relation to the states of the system at its commencement, of the phenomena in its course, and of the structural changes existing in cases which have terminated fatally. The writer was the first who demonstrated, by *post mortem* research, inflammatory appearances of the membranes of the spinal chord; but he cannot on that account infer that the disease is owing to that cause. Indeed, in the case in which he observed it, the affection of these membranes was recognised, during the life of the patient, as a contingent lesion arising from metastasis of the rheumatism with which it was associated. M. Serres, having found disease of the *corpora quadrigemina* in four cases, considers these bodies as the seat of chorea, and thinks the results of his experiments, and of those of MM. Flourens and Rolando, on the functions of this part of the brain, countenance this opinion. Other pathologists, particularly MM. Bouillaud and Magendie, conceive that it is seated in the cerebellum, because the functions which they ascribe to this organ are chiefly affected — the disease, in their opinion, consisting of disorder of the actions of this part. If we reflect, that a number of disorders, more or less resembling each other, have been considered as chorea; that these, as well as chorea itself, are often complicated with, or run into, other affections of an organic or inflammatory kind; and that it is never fatal excepting in consequence of its consecutive and associated changes, especially those affecting the brain and spinal chord; the diversity of lesion observed after death, and of opinions derived from this source chiefly as to its seat, will not appear surprising.

16. I think that chorea, in its simple state, occurs most commonly in persons whose vital powers are depressed, the whole circle of vital organs performing their functions imperfectly, and thereby occasioning increased susceptibility of the nervous system. This state constitutes the aptitude to be affected by the exciting causes of this disorder; whether those acting directly upon the brain, through the medium either of the mind itself or of the senses, as terror, fright, mental impressions, moral emotions, &c.; or those which influence indirectly the cerebro-spinal nervous system, by irritating or otherwise disordering the organic nerves, as worms, morbid matters in the prima via. The susceptibility of the frame having been induced, either class of causes may occasion the malady, — the former, by changing the condi-

tion of those parts about the base of the brain which direct or influence the functions of the spinal chord, and, through it, of the voluntary muscles, — the latter, by disordering the functions of the organic nervous system, and thereby affecting, through the medium of the branches communicating with the ganglia placed on the roots of the spinal nerves, the nerves of voluntary motion: occasioning the irregular muscular movements constituting the disease, in the same manner that irritation of the visceral nerves produces the automatic movements of the fœtus *in utero*. In such cases, the disorder of the organic nerves may be extended, by means of the sympathetic, to the spinal nerves either of one side only, or of both, as well as to the nerves and parts about the base of the brain, disease being also subsequently induced in those parts of the brain or spinal chord in which they originate. According to this view, will readily be explained the frequent connection of chorea with hysteria and uterine disorder, as the patient advances through the period of puberty and adolescence, as well as the disappearance of the disease after the developement of the sexual organs, and the healthy establishment of the uterine functions — events intimately related with, and necessary to, the due manifestation of vital energy throughout the frame.

17. In other words, therefore, the *proximate* cause of chorea, in its simple and true form, seems to consist of debility, with some degree of irritation of the organic or ganglial class of nerves, extended more or less to those of volition, and occasioning morbid susceptibility of the nervous system generally, with diminished power, increased mobility, and irregular actions of the muscular system, particularly of those muscles supplied with the nerves principally affected. Whilst this appears to be the pathological state of the majority of cases of chorea, yet instances not infrequently occur in which disorder evidently commences in the spinal chord or its membranes, disturbing the functions of the nerves issuing from the affected part. In many cases, the lesion of the chord and of its membranes is occasioned by irritation propagated to the roots of the voluntary nerves; but in those which are connected with rheumatism, as well as in some otherwise related and produced, the mischief evidently originates in the membranes of the chord itself. When, however, the disease commences in the organic nervous system, affecting the voluntary nerves only secondarily, pain is not complained of upon examining the spinal column; but when it is seated in the chord or its membranes, pain or uneasiness is felt in this situation, and the disordered motions are more or less limited to particular parts. When the original cause of mischief is seated in the brain, or when the cephalic organs become consecutively diseased, the affection partakes more of the characters of true convulsion, either with or without hysterical symptoms, but most commonly with such phenomena.

18. V. OF NERVOUS DISORDERS RESEMBLING CHOREA. — Whilst true chorea, according to the application of the term in recent times, seems to originate in the organic nerves, and to disturb the functions not only of the voluntary nerves, as explained above, but also of those parts of the cerebro-spinal axis in which they originate; the affections I am about to notice, most commonly depend upon a disordered state either of the mind, or of some of the parts within the cranium, and are often attended by more or less affection of the generative and digestive organs. The disease to which the name *Chorea Sti. Viti* was first applied, very nearly resembled that produced by the bite of the *tarantula*, as it is described by BAGLIVI and SAUVAGES; and, if the description of the former disorder furnished by SCHENCK, PARACELSUS, and FELIX PLATER had not been confirmed by the more accurate observation of modern practitioners, it might have been viewed as greatly exaggerated, if not entirely feigned. *a*. The chorea of the writers of the sixteenth century appears to have consisted of inordinate muscular exertions and movements in regulated measures, proceeding from an irresistible mental impulse, excited by the influence of music or imitation on the mind. HORSTIUS states, that it sometimes recurred annually at the same period; and that the sound of music often increased it to a state of phrensy, those affected continuing dancing for an incredibly long period, in a most excited manner. It appears to have consisted chiefly of a sort of lascivious dance, kept up an uncommon length of time, until the impulse to excessive muscular motion was subdued by exhaustion, and has not inappropriately been called *Morbus Saltatorius* and *Epilepsia Saltatoria* by later writers. *b*. According to the account given by BAGLIVI and SAUVAGES of the effects of the bite of the *tarantula*, the patient is seized, a few hours after the injury, with difficulty of breathing, anxiety, and sadness. The violent symptoms of the first days are succeeded by a peculiar melancholy, which continues until, by dancing or singing, it is at last entirely removed. Persons thus affected frequent churchyards and solitary places, lay themselves out as if they were dead, evince the utmost despair, howl and sigh, assume various indecent attitudes, run about, or roll themselves on the ground, and are either pleased with or dislike particular colours. Shortly after being stung, they fall down, deprived of sense and motion, either breathing with difficulty and sighing heavily, or lying as if quite dead. Upon the sound of music they begin to move their fingers, hands, feet, and successively all the parts of the body, sighing, dancing, and assuming a thousand fantastic gestures. They continue these motions for several hours, until they are exhausted, and covered by perspiration; but they return again, after some repose, to this violent exercise, which is kept up for ten or twelve hours each day, during four or five, but seldom so long as six days. This affection has received various names from Continental writers, amongst the chief of which are *tarantismus, tarantulismus, Choreomania, Melancholia saltans, Chorea Sti. Johannis, Chorea Sti. Valentini*, and *Dæmonomania*.

19. According to the above account of both affections — the original *chorea* of the Germans, and the *tarantismus* of SAUVAGES — there appears to be but little difference between the latter, at its advanced or second stage, and the former. It is very difficult to believe that the whole, or at least the greater part, of the phenomena in both these affections was not feigned. It is, however, admitted, that the poison of the tarantula spider is most successfully counteracted by the exciting

influence of music on the mind, and the profuse perspirations produced by continued dancing. A writer in the *New York Medical Repository* details an instance of a convulsive disorder occasioned by the bite of a spider, and cured by music. Mr. KINDER WOOD has recorded a case, which originated in disordered menstrual function, with cerebral symptoms and painful affections of the nerves of the face, that resembled in every respect the malady to which the German physicians gave the name of chorea.

20. The disorder, also, which has usually been called the "*Leaping Ague*" in Scotland, seems to be very closely allied to the original chorea. It is described very nearly as follows by a writer in the *Edinburgh Medical and Surgical Journal*: — Those affected first complain of a pain in the head or lower part of the back, to which succeed convulsive fits, or fits of dancing, at certain periods. During the paroxysm, they distort their bodies in various ways, and leap about in a surprising manner. Sometimes they run with great velocity even in dangerous places, and when confined, climb or leap from the floors of the cottages to the rafters, or swing by, or whirl around, one of them. They often dance or leap about with greater agility, vigour, and exactness than they are capable of exerting at other periods; the affection apparently consisting chiefly of a morbid and irresistible propensity to dance, tumble, and run about in a fantastic manner. Cases of this form of disorder have been detailed by TULPIUS, PENADA, REIL, BRÜCKMANN, WESTPHAL, CRICHTON, PIEDAGNEL, LAURENT, and others. In M. PIEDAGNEL's case there was a propensity to run forwards, until the patient, a man, dropped down exhausted. On examining the brain after death, tubercles were found pressing on the anterior part of the hemisphere. A similar instance occurred in the father of a medical friend, and terminated in paralysis. The subject of M. LAURENT's case was propelled backwards with considerable velocity.

21. Dr. WATT has given the history of a disorder which he has called chorea, or periodical jactitation, in a girl of ten years, that was preceded by excruciating headach and vomiting. To this affection of the head succeeded the propensity to turn around in one direction on her feet with great velocity, like a spinning top. This propensity subsided after having continued above a month, but was followed by an exasperated return of the headach, and loss of power over the muscles of the neck. She was afterwards seized by a different kind of motion, occurring in fits, which lasted daily, from two or three, to six or seven hours; this consisted in placing herself across the bed, and rolling rapidly round on her sides from one end of it to the other. When laid in the shallow part of a river she rolled around, although at the point of being drowned. The affusion of cold water did not stop the rotations, which were about sixty in a minute. In a little more than a month these movements were replaced by others of a different kind. She now laid herself on her back, and, drawing her head and heels towards each other, raised her trunk, afterwards falling with some force on her back by straightening her body. These motions were repeated ten or twelve times in a minute, were continued for about five weeks, and were then followed by the propensity of standing upon her head. Having raised her feet perpendicularly upwards, she fell down as if dead, but instantly placed herself on her head as before, again fell, and continued to repeat these movements for fifteen hours a day, and as rapidly as twelve or fifteen times a minute. The affection had resisted emetics, cathartics, local depletion, blistering, setons, &c., but disappeared after a spontaneous diarrhœa. Dr. WATT refers to two similar cases which had come to his knowledge; and another instance has been adduced by the writer, under the designation of "*Inquirer*," of an instructive article on the subject, in the third volume of the *Edinburgh Medical Journal*. Mr. HUNTER has also given the particulars of an instance of rotatory affection resembling chorea, in the twenty-third volume of the same work.

22. Dr. ROBERTSON has described a peculiar form of convulsion, in many respects like chorea, which spread at one time (1800) as an epidemic amongst a sect of religious enthusiasts in the states of Tennessee and Kentucky, evidently from the influence of imagination and irritation on morbidly excited minds. The seizure was violent, and distinctly convulsive at the commencement, but it usually passed from this state into one more chronic, and more nearly approaching chorea. Persons thus affected are described by Dr. ROBERTSON as being continually interrupted in their conversation by the irregular contractions of the muscles, and as having no command over these contractions by any effort of volition; lying down in bed does not prevent them, but they always cease during sleep. Remissions and exacerbations are common, but occur without regularity. During the remission, a paroxysm is often excited by the sight of an affected person, but more frequently by shaking hands with him. The sensations of the patient during the fit are said to be agreeable, and are expressed by the enthusiastic by laughing, shouting, dancing, &c., followed by fatigue, and a sense of general soreness. The affection at last becomes slighter by degrees, and finally disappears. Cases of similar nervous disorders, and apparently intermediate between chorea and convulsions, and often partaking of many of the features of hysteria, as well as the affection called *Malleatio*, have been detailed by TULPIUS, HORSTIUS, MORGAGNI, WICHMANN, MAJENDIE, and others above referred to (§ 20.). It is difficult to believe, however, upon perusing the particulars of the foregoing cases, that they are altogether the actual phenomena of disease. It is very probable that the morbid affection of mind, — the disordered state of the desires, or of the mental impressions, — exalts the derangement of the nervous system to that singular pitch, of which these cases are rare examples. (See arts. CONVULSIONS, and HYSTERIA.)

23. VI. TREATMENT. — *A. Conspectus of the treatment*. *Purgatives* have been recommended in chorea by SYDENHAM, WHYTT, HAMILTON, CHEYNE, and others. SYDENHAM, however, did not confide the cure of this affection to them entirely, for he also directed occasional depletion, with tonics in the days intervening between the exhibition of the purgatives, and narcotics at bedtime. *Emmenagogues*, particularly aloës, myrrh, assafœtida, hellebore, savine, castor, the melissa officinalis, spiritus ammoniæ succinatus, saffron,

borax, &c. have been very properly prescribed by Richter, Schmidtmann, and several other German writers, particularly when the disease occurs about the period of puberty, and is connected with hysteria, or disorder of the menstrual discharge. *Anthelmintics* are the chief medicines advised by Hufeland and Thilenius. Watt and Sallaba viewed the disorder as possessing an inflammatory character, and therefore directed for it the antiphlogistic regimen. *Tonics* have found supporters in Dover, Werlhof, Mahon, Eckstein, Hildebrand, Elliotson, and many other writers. But they do not agree in the kind of tonic which should be employed: thus, Hildebrand prefers the *sulphuric* and *mineral acids*; Werlhof and Mahon, the *cinchona* bark; Griffith prescribes the bark, with the carbonate of *potash*. Eckstein, Wendt, and Elliotson recommend the preparation of *iron*, in preference to other tonics. The *fixed alkalies* have been noticed favourably by Wendelstatt; and the mineral springs at Ems by Brückmann. Sir Geo. Baker, Nagel, and Michaelis prescribed the flowers of the *cardamine pratensis;* the latter in doses of a drachm every six hours. The leaves of the *Seville orange tree*, in the form of powder, decoction, or infusion, were much praised by De Haen, Westerhoef, Werlhoff, and Engelhard. The *arnica montana* received the commendation of Theussink; and the *chenopodium ambroisioides*, that of Plenck and of Ecker.

24. *Narcotics and sedatives* have also been prescribed in this affection. The inspissated juice of the root of the *belladonna* was employed in doses of one sixth of a grain, with apparent advantage, by Stoll, Lentin, and Ketterling. Stoll, however, directed at the same time friction with a liniment composed of the spiritus serpilli, essentia castorei, and camphor, to which I am inclined chiefly to attribute the benefit derived. M. Allamand has likewise prescribed belladonna with advantage. *Stramonium* was used by Sidren; *digitalis* by Uwins and some others; and *opium* by Swainston. The *prussic acid* has lately received the commendation of Mr. Stuart. He employed it in two cases, after purgatives had been exhibited in large doses, with decided advantage. The *prussiates* of iron or of zinc are also productive of benefit.

25. *Antispasmodic* remedies have been resorted to by several physicians. *Camphor* has obtained a well-deserved notice from Werlhoff, Mahon, Wilson, and others. The *cuprum ammoniatum* has been prescribed by Dr. Walker, after alvine evacuations, and found beneficial in cases where bark and other tonics have failed. Willan, Uwins, Delarive, and Theussink have also spoken of it favourably; and Merk carried it so far as to produce an emetic effect. *Valerian* has been recommended by Bouteille, Bernt, Murray, Guersent, &c. After the bowels have been evacuated, it is in many cases an excellent remedy, either given by the mouth, or administered as an enema. The *oxyde of zinc* has received a very extensive trial in this affection from Hart, Burseri, Thilenius, Schraud, Wright, Hufeland, and Kerst. Stoll, however, states that no benefit is derived from it, although pushed to a great length. I have seen much more advantage produced from the sulphate than from the oxide of zinc. Although the oxide may be given without advantage, and irritate the stomach, the addition of a full dose (gr. ij.) of the cuprum ammoniatum in combination with the zinc will be borne without inconvenience. This fact, which was first noticed by Dr. Odier, of Geneva, in a letter to Dr. Duncan, may be taken advantage of in the treatment of chorea; for I am not aware that it has as yet been acted upon in respect of this disease. The *nitrate of silver* has likewise been fully employed, and certainly with benefit if purgatives have been premised. Franck, Uwins, and Crampton have found it successful in extremely obstinate cases.

26. *Arsenic*, in the form of Fowler's solution, has also been directed with advantage in severe cases of chorea, especially after free alvine evacuations have been procured, by Mr. Martin, Dr. Salter, and Dr. Gregory. *Iodine* has been given by Dr. Manson, Dr. Gibney, Dr. Peltz, and myself; and, when judiciously prescribed, particularly when the disease appears about puberty, and is connected with obstructed menstruation, is often of great service. In cases of this kind, a blister applied over the sacrum, as recommended by Dr. Chisholm and Mr. Swan, and found beneficial by them, has been productive of marked advantage in my practice. The propriety of *scarifying* deeply the gums, when the affection occurs about the period of second dentition, has been very properly insisted upon by Dr. Gregory and Dr. Monro.

27. The *cold bath* has been much used by M. Dupuytren in chorea, and *sea bathing* has been recommended by Hufeland and Himly; but the *shower bath*, or the simple *affusion of cold water* on the head whilst the patient is seated, is preferable at first, in my opinion. If the shower bath be directed in cases of females, the patient should stand, whilst receiving the bath, in a pan of warm water. Dr. Ferrari prescribed with benefit a solution of *tartarized antimony* internally, and *ice* along the vertebral column, followed by immersion daily in a cold bath, and by purgatives, bitter tonics, and hyoscyamus. *Setons, issues,* and *moxas* in the neck, or over the vertebræ of the back, have also been employed by several practitioners. Dr. Aliprandi, however, relates a case where issues and *moxas* proved of no service. Drs. Physick and Young have made use of the *black snakeroot*, the *cimicifuga racemosa*, and experienced decided advantage from it. This substance seems to act more rapidly than others in the cure of the disease, and without any sensible action on the secreting functions. It is given in doses of from ten grains to a drachm. The animal oil of Dippel has been found of service by Werlhof; the *cajeput oil* by Ramspek; and the *cod* and *tusk-liver oil*, and *spirits of turpentine* by the author, who first prescribed them in this disease. *Electricity* has been suggested by De Haen, Fothergill, Schaeffer, &c.; and *galvanism* by several writers. Large doses of *musk* were directed by Dr. Maton and Dr. Powell, after free alvine discharges had been procured.

28. Respecting the propriety of *blood-letting* in chorea, much contradictory evidence has been furnished. Sydenham prescribed it as a subsidiary remedy; Dr. Cullen states that it was sometimes useful, at other times injurious; Dr. Watt obtained, he informs us, decided advantage from the practice; Dr. Armstrong found

it very hurtful; and Dr. CLUTTERBUCK trusted to it almost entirely, repeating it several times after intervals of a few days. M. BOUTEILLE viewed the disease as either congestive or inflammatory, and commenced the treatment with blood-letting, which he generally repeated, and with purgatives. M. SERRES, having observed vascular turgescence about the corpora quadrigemina in four fatal cases, has recommended *leeches* and *counter-irritants* to be applied to the upper part of the spinal column; and M. LISFRANC, also, has directed blood-letting and leeches to the nape of the neck. Dr. HUNTER and Dr. HARROWER have depended upon purgatives and the inunction of the *tartar emetic ointment* on the scalp and along the spinal column. *Aromatic liniments* to the spine were directed by CHRESTIEN; the turpentine and camphor *embrocation* to the same situation, by the author; and *tartar emetic plasters* by Dr. JOHNSON, who also advised a grain of the nitrate of silver, with two grains of pilul. hydrarg. and five of the extr. colocynth. comp. as a purgative. It may further be added, that ECKER justly insists upon the superiority of *sulphur* as a purgative in this disease. The application of *blisters* to the spine has been recommended; but, in two cases in which I have had recourse to this practice, I thought the effect was injurious rather than beneficial.

29. *B. Treatment recommended by the Author.* — A careful consideration of the nature of the disease will readily suggest a rational treatment. The *first indication* is to remove morbid secretions and fæcal accumulations, the usual cause of irritation of the organic nerves. The *second*, to subdue vascular irritation or erythism of the vessels of the spinal chord or brain, when the symptoms indicate its existence. The *third*, to rouse the energy of the organic nervous system, and the vital actions of the assimilating and secreting organs, and to impart energy to the frame. *a.* A judicious employment of purgative remedies, varied according to the peculiarities of the case, and the states of the patient's system, is indispensable to the fulfilment of the first intention. When the disease appears previously to approaching puberty, it is not very material what kind of purgatives are first prescribed: but it should be recollected, in the treatment of this disease, perhaps, more than in many others, that a judicious combination of purgatives, with tonic, or stimulating, or antispasmodic remedies will more rapidly restore the patient than confiding in purgatives merely. Indeed, we are enabled, by such combinations, partly to accomplish two indications of cure at the same time; and frequently we secure a more decided operation on the bowels and secreting viscera by the combined means. It will very generally be necessary to commence with the exhibition of a full dose of calomel, either alone or with other purgatives, or followed by them five or six hours afterwards: but the doses of calomel ought not to be frequently repeated in this disease; nor, in my opinion, will it be found serviceable to continue purgatives long, without either exhibiting them with a bitter tonic or antispasmodic remedy, or with both, or alternating them with these remedies. When purgatives are thus prescribed, they may be continued longer, not only without producing any detriment, but generally with decided advantage. Cases will not infrequently occur, in which little or no benefit can be remarked until they have been given almost unremittingly for a long period — the evacuations being at first nearly natural, but afterwards betraying disorder, and proving that the repeated exhibition of purgatives was requisite to unload the biliary ducts and gall-bladder, and remove fæcal matters retained in the cells of the colon. For this purpose, I have generally preferred the compound infusions of gentian and senna, in equal proportions, with some antispasmodic and a corrigent. This combination seldom acts frequently, but usually copiously. The oil of turpentine, either followed, soon after its exhibition, by some other purgative, if it does not act upon the bowels, or combined with it, is extremely beneficial; and, whenever the evacuations are offensive, or of a morbid appearance, especially if the case be complicated with worms, ought never to be neglected. In such cases, a single dose of calomel at bed-time, followed, in the morning, with the turpentine, combined with castor oil (in the proportion of three parts of the former to two of the latter), and floating on the surface of milk, or some aromatic water, is most decided. In this affection especially, the medical attendant should examine carefully the state of the evacuations, and be guided, in a great measure, by their appearance, as to the repetition and selection of purgative medicines. The benefit derived from this class of remedies in chorea was sufficiently demonstrated by Drs. HAMILTON and PARR, and, although questioned by several practitioners of the present day, cannot be denied. Instances of their failure have been chiefly owing to the neglect of combining them in the manner insisted upon above, or of exhibiting tonics, stimulants, or antispasmodics, in the intervals between their operation. The good effect of treatment, as well as the operation of purgatives, will be much enhanced by rubbing either of the liniments F. 296. 311. on the loins or abdomen, once or twice daily, and by allowing a light nutritious diet, chiefly of animal food.

30. *b.* Contemporaneously with the fulfilment of the *first* indication, the *second* should receive due attention. In many cases, the means used to accomplish the former will be sufficient to remove existing irritation about the roots of the voluntary nerves; but when we have marked evidence of irritation of these parts, or of determination of blood to any part of the cerebro-spinal axis or investing membranes, either in the state of the pulsation of the carotids, increased temperature of the head, coldness of the extremities, tenderness or pain from the occiput along the spinal column, particularly when pressing between the vertebræ on each side of the spinous processes, the application of leeches behind the ears or along the spine, and repeating them according to circumstances, or cupping in that situation, will be requisite, and not incompatible with the use of tonic and antispasmodic medicines, in cases presenting symptoms indicating the propriety of resorting to them. After leeches, the cold affusion on the head or on the spine, night and morning, or the shower bath; rubefacient liniments to the latter situation, or the tartar emetic ointment or plaster; warm woollen clothing on the lower extremities, and attention to the mental emotions; constitute important parts of the treatment.

31. An accurate idea of the remote causes of the disease, as well as of their probable operation and continued effect, should lead not only to their removal as far as possible, but also to a treatment modified accordingly. The mental impressions and moral emotions are often more or less affected, particularly in those irregular forms of disorder, which have very generally been confounded with chorea. This circumstance should not escape the attention of the physician, as it points to the employment of moral management in aid of medical measures. As the mental affection, when it exists, has generally an intimate relation to the remote causes of the disease, the importance of ascertaining the existence of the former, as well as the nature of the latter, as a basis of an appropriate treatment, must be manifest.

32. *c.* Having removed accumulations of morbid matters, and subdued irritation existing about the origin of the voluntary nerves, or in parts of the cerebro-spinal axis, or enveloping membranes, and having excited the actions of the secreting and assimilating organs by the means stated above, the *third* intention of cure is to be now entered upon in a more decided manner, by the exhibition of tonics combined with antispasmodics, and by due attention to the state of the bowels, and functions of the secreting viscera and surfaces. The combination or alternation of bitter tonics with aperients and antispasmodics will often be necessary during this stage of the treatment; or an occasional dose of a brisk purgative, or of calomel, will be exhibited with advantage during the employment of tonics. Even when the bowels are so active as apparently to render this interference unnecessary, a dose of the pilula hydrargyri, given once or twice a week, either with or without the pilula aloës cum myrrha, will be found serviceable. As to the choice of tonics, no immutable rule can be laid down. The state of the pulse, and of the secreting organs, should be the chief guide in the selection of them. Attention to the mode of combining them is also of much importance. Bark, in any form, will be beneficial when judiciously prescribed. The following powder will be found serviceable, and may be taken in some aromatic water; the doses of the ingredients being varied according to the age of the patient, and the state of the bowels: —

No. 126. ℞ Pulv. Cinchonæ gr. xij.; Pulv. Rhei gr. viij.; Sodæ Sub-carb. gr. x.; Pulv. Capsici Annui gr. ij. Misce.

If the decoction be preferred, it will be found most beneficial when given with liquor ammoniæ acetatis, and a little of the spiritus ammoniæ aromaticus. The sulphate of quinine is an excellent medicine, especially when the patient is old enough to take it in the form of pill, when it may be most advantageously combined with aloës, as in F. 572—577., or with camphor and aloës as follows. In this state of combination a decided action will be exerted on the bowels.: —

No. 127. ℞ Camphoræ rasæ, Quininæ Sulphatis, āā ℈ j.; Extr. Aloës Purif. ʒ ss.; Extr. Gentianæ (vel Pilul. Galban. Comp.) ʒ j.; Syrup. Simp. q. s. M. Fiant Pilulæ xxxvj., quarum capiat binas bis quotidiè.

33. In this stage of treatment much advantage will often be obtained from *valerian*, combined with other antispasmodics and tonics, or with the alkalies (F. 269. 368.); from the preparations of *iron*, as recommended in the article on CHLOROSIS, (§ 13.), or in F. 521. 523.; and from the sulphate of zinc (F. 582—587), or the arsenical solution (F. 364.). As chorea is sometimes complicated with disease about the heart, or the roots of the voluntary nerves, or the membranes of the brain or spinal chord, of an inflammatory nature, care should be taken not to exhibit this last active substance, or even the preparations of iron, or of bark, until the symptoms of these complications have been removed by local depletions, cold affusions, or the shower bath, and counter-irritation. A similar precaution is still more requisite in respect of the employment of *strychnine*, or the nux vomica (see F. 443. 541, 542. 565. 907.), which I have found of much service in the advanced course of treatment of the simple form of chorea, or when it has been associated with rheumatism of the joints or extremities, with chlorosis, hysteria, or amenorrhœa; in which complicated states of the disease I have likewise found the tincture of iodine, and hydriodate, or ioduretted hydriodate of potash of great service (F. 234. 722.). The formulæ for the above medicines given in the Appendix, or the following, may be adopted: —

No. 128. ℞ Olei Valerianæ ♏ xij.; tere cum Sacch. Purificati ʒ iijss.; tum adde Infus. Valerianæ ℥ vijss.; Liq. Arsenicalis ♏ xv. ad. xxx. Misce. Capiat cochlearia duo larga ter quotidiè.

No. 129. ℞ Pulv. Calumbæ gr. x.; Pulv. Valerianæ gr. xij.—℈ j.; Carbon Ferri Præp. gr. x.; Pulv. Cinnam. gr. vj. M. Fiat Pulvis, vel Electuarium molle cum Syrup. Zingib. q. s., bis terve quotidiè sumatur.

No. 130. ℞ Carbon Ferri Præp. ℥ ss.; Pulv. Supertart. Potassæ ʒ vj.; Confection. Sennæ, Syrup Zingiberis, āā ℥ jss. Misce. Fiat Electuarum, cujus capiat Cochleare unum minimum mane nocteque.

No. 131. ℞ Carbon. Ferri; Sulph. Præcip. āā ʒ ij.; Potassæ Supertart. Pulver. ʒ v.; Confectionis Sennæ et Syrup. Zingiberis āā ℥ jss. Misce. Fiat Electuarium. Sumatur Coch. unum minimum mane nocteque.

No. 132. ℞ Sub-boratis Sodæ, Supertart. Potassæ, āā in Pulv. ʒ iij.; Carbon. Ferri ʒ ij.; Confectionis Sennæ ℥ ij.; Syrup. Zingiberis q. s ut fiat Electuarium molle, cujus Cochleare unum minimum mane nocteque sumatur.

34. During the use of these medicines, the tartarized antimonial ointment or plaster may be applied to the spine; and when the tonics are not combined with aperients, the former may be exhibited in the course of the day, and the latter at bed-time, as they may be required. The nitrate of silver may also be tried in doses of half a grain, or a grain, combined with aloes, or the aloes and myrrh pill.

35. C. *The treatment of the complicated and irregular states of this disease* must necessarily be modified according to the diversified form it assumes. The association of the disease with rheumatism has been observed by me on several occasions, and, in nearly all, there has been a marked disposition of the rheumatic affection to recede from the joints or extremities, and attack the internal fibro-serous membranes, as those of the cerebro-spinal axis and the pericardium. This unfavourable result has generally been promoted by a too lowering treatment; but prevented by tonic and stimulating medicines, with due attention to the alvine evacuations. In cases, therefore, complicated with rheumatism, chlorosis, anæmia, or retention of the menses, the purgatives selected should be of a warm and stomachic kind, or combined with cordial and stimulating substances; the ammoniated tincture of guaiacum, camphor, serpentaria, and similar medicines, being also employed. In these states of disease, the internal use of the cod or tusk-liver oil will be found most beneficial. Having observed instances

in which the suppression of the rheumatic affection of the joints by the use of embrocations and liniments was rapidly succeeded by the appearance of internal disease, the application of such remedies to the external seat of the rheumatic disorder should not be resorted to.

36. In the *irregular forms* of chorea, particularly those which present more or less of an hysteric character, the functions of the uterus, and the circulation of the brain or spinal chord, or both, are often disordered. In these it will be requisite not only to evacuate the bowels freely, but also to allay uterine irritation, where it seems to exist, by leeches applied to the tops of the thighs, or cupping over the sacrum, and to promote the monthly evacuation, when scanty or retained, by purgatives and emmenagogues. In many cases of this description, the application of a number of leeches to the occiput, neck, and behind the ears, the cold affusion on the head, or the shower bath, with warm clothing on the lower part of the body, and due regulation of the moral emotions, will materially aid the treatment. The more the attack assumes the characters of tonic convulsion, the more requisite will it in general be to have recourse to local depletions, especially if the affection occur after puberty, and be connected with interrupted menstruation.

37. During convalescence, and even in the advanced course of treatment, change of air, agreeable amusement, exercise in the open air, the use of chalybeate or aperient mineral waters, and a light nutritious diet, commencing with warm salt water bathing during the treatment, and concluding with cold salt water bathing in advanced convalescence, followed by smart frictions of the surface of the body upon coming out of the bath, will materially promote and confirm recovery, as well as prevent a return of the disease.

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CLIMACTERIC DECAY.— *Climacteric Disease.*

Classif. 3. *Class.* 4. *Order* (Good). I. Class. V. Order (*Author*).

1. Defin. *General decline of the vital powers, at the age of senescence, without any evident cause.*

2. The ancients believed that very important changes took place in the economy at certain periods; the first being the seventh year, and the subsequent epochs answering to the numbers resulting from the multiplication of three, seven, and nine, into each other: as the twenty-first, the forty-ninth, the sixty-third, and the eighty-first years. The two last were called grand climacterics, as the life of man was supposed to have reached its allotted term. The doctrine of climacteric periods has been traced to Pythagoras, who derived it from the Egyptians; and, although its truth has been denied by many eminent physicians, it has been believed in by others. The changes which take place at these epochs are of two opposite kinds; that of renovation, and that of decay. It is the latter of these which will here be considered.

3. Symptoms. — This disease has been very minutely described by Sir H. Halford. It usually comes on insensibly. The patient first complains of fatigue upon slight exertion; his appetite becomes impaired; his nights are disturbed or sleepless, and his mornings unrefreshed. The tongue is somewhat white; the pulse a little accelerated; the face extenuated, occasionally slightly bloated; the body emaciated, and the ankles and legs disposed to swell. The urine is not deficient, but the bowels are sluggish, and pains, with vertigo, are occasionally felt shooting through his head and various parts of the body, but are not possessed of the rheumatic character. As the vital exhaustion proceeds, the stomach loses all its powers; the emaciation is greater; the lower limbs are more œdematous; restlessness through the day and sleeplessness through the night increase, and all the vital manifestations,

mental and physical, are gradually extinguished. Such is the usual progress of the simple form of the disease, or rather gradual decay of the vital energies, — a decay which is not peculiar to, but which may occur at any time intermediate between, the grand climacteric periods. This simple form of decay is, however, less frequently observed than its complication with other affections. Persons who, together with the anxieties, griefs, and distresses of life, have been subject to disease of some particular organ, as of the lungs, liver, brain, heart, &c., who are of a gouty, rheumatic, or calculous diathesis, generally experience at these epochs an aggravation of such diseases, which assume a more dangerous character from the vital decay which is thus attendant upon them. Indeed, in most cases, these accidents, moral and physical, constitute the exciting causes or occasions of the appearance of climacteric disease, as well as complicate and aggravate its progress.

4. CAUSES. — This disease is more common to men than women, probably owing to the more tumultuous and exhausting life passed by them — to their greater exposure, during the preceding terms of existence, to the numerous causes of mental and corporeal exhaustion incidental to the states of modern society and civilisation. It is not infrequently occasioned by the mental depression arising out of pecuniary losses and disappointments, and the death of old and attached friends and relatives. Thus, we sometimes observe it proceed rapidly to a fatal issue, or combated with great difficulty, after the loss of the partner of the principal part of the patient's existence. It may also be caused by a marriage contracted late in life, or by unusual intemperance, or some accidental shock or commotion of the frame.

5. As to its *nature*, climacteric decay is obviously the concatenated phenomena arising from that exhaustion of the vital energies which takes place at a more or less advanced age, in consequence of the cares, turmoils, and physical exertions, attendant on the existing states of society, particularly in the middle classes of life; the exhaustion manifesting itself especially in these functions which are most intimately related to, and concerned in, the perpetuation of the vital endowment of the frame, and which are actuated by the organic system of nerves. As this decay of the vital energies — this breaking up of the constitution, as it is commonly called — is necessarily experienced by the whole frame, it is obvious, that it may not only be hastened by whatever is either mentally or corporeally injurious, as well as by specific forms of disease, but that it will be more or less remarkably evinced in those organs which have especially suffered during attacks of previous illness: hence the complicated states in which senile decay is usually observed, and the rapid progress and unfavourable issue of maladies appearing about the climacteric periods.

6. TREATMENT. — The simple form of this disease requires tonic and cordial medicines, with generous diet, a dry wholesome atmosphere, change of air, the occasional use of the tonic and deobstruent mineral waters; agreeable occupations and amusements; and, above all, the consolations arising out of the recollection of a well-spent life, and confidence of the future. During the course of treatment, particularly of the complicated states of the affection, the digestive, secreting, and excreting functions require to be assisted, by means of the warm, bitter, and cordial aperients (F. 86. 214. 266. 572.); and if internal congestions, or sub-inflammatory disorders, manifest themselves, evacuations should not be practised without combining or alternating them with restoratives and tonics. The best aperients are, in such circumstances, rhubarb or aloes combined with gentian, quinine, guaiacum, or myrrh, or with the carbonates of the alkalies and the balsams. But, on all occasions, even of acute disease occurring at the climacteric epochs, it should be recollected, that the vital energies soon feel the shock, not only of the malady, but also of a too active or lowering treatment; and that, even when such practice is most required, we should endeavour to support the powers of life by means the best calculated to fulfil this object, without increasing the morbid action, and to meet the first indications of depression or exhaustion by suitable cordials and tonics. The utmost attention should also be paid to the previous habits and indulgences of the patient; and if the discontinuance of them is likely to sink the constitutional energies still lower, they ought not to be relinquished. Various instances have occurred, showing the ill effects of want of attention to the above caution, during the course of my practice.

7. A gentleman had been for some years attended by the writer. At the age of eighty-one years, during a severe winter, he suffered much from bronchitis, accompanied with great sinking of the vital energies. His habits were social, and he lived highly. He recovered, however, by means of warm diaphoretics, and tonic cordial aperients, with a due regard to his accustomed indulgences, and to the precept of HOFFMANN, "*ne subito muta assueta, quia assuetudo est altera natura.*" The following year he had a similar attack, at his seat in the country. A nearly opposite treatment to that which was adopted by the writer in his previous illness was directed by his medical attendants on this occasion, and in a few days he expired *when seated* on the night-stool, (see HOFFMANN's treatise "*De Situ erecto in Morbis periculosis valde noxio*,") about half an hour after the physician had left him, and given a favourable opinion of the result to his friends.

8. General —— had served nearly all his life in the East Indies, and was upwards of eighty, but of a robust constitution. His ailments, when he was seen by me, could not be referred to any particular organ, and were attributed at the time to senile decay: the liver performed its functions. Nothing beyond the regulation and promotion of the digestive and excreting functions was attempted; and he was allowed a light and nutritious diet, with change of air, the use of the Bath water, &c. Under this plan he improved greatly, and was able to travel with ease from one part of the country to the other, and, when in town, to dine daily at the Oriental Club. The last occasion but one on which I saw him, he came to my house, to inform me that his relatives were not satisfied with the progress he had made, and had repeatedly urged him to change his physician. I accordingly retired; but, a few days afterwards, was requested to see him. He was then sinking fast, evidently from the effects of a lowering treatment and of profuse evacuations upon a decayed frame. Speedy dissolution could not be averted;

I therefore declined all interference. He died not many hours afterwards.

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CLIMATE. Syn. (From κλίμα, a region). — *Climat*, Fr. *Das Clima*, Ger. *Clima*, Ital.
Classif. General Pathology — *Ætiology and Therapeutics.*

1. Climate, in its rigorous acceptation, means only a district placed between certain equatorial and meridional circles; but it possesses a much wider signification in medicine, and is more commonly applied to the conditions of the soil, surface, elevation, and position of a country, in connection with the general states of the atmosphere, influencing the health of the human species, and of the higher races of the animal kingdom: — "L'ensemble de toutes les circonstances naturelles et physiques, au milieu desquelles nous vivons dans chaque lieu." — Cabanis.

2. I regret that my limits will not admit of entering fully upon the consideration of the physical conditions which combine in forming the climate of a country, and not only modify the constitution of men, giving rise to a great part of the most acute diseases to which he is liable, but also assist in removing others of a dangerous tendency. It is obvious, that a knowledge of the elements out of which disease arises, and which may be taken advantage of, and even artificially combined, for its removal, must be of essential advantage in the healing art. Indeed, the importance of the subject has been admitted since the time of Hippocrates, whose treatise περί ἀέρων ὑδάτων καὶ τόπων will be read, even at the present day, with the greatest advantage. I shall, therefore, draw a mere sketch of the subject, and indicate the sources whence more detailed information may be obtained.

3. I. The Physical Relations of Climate. — The climate of a district or of a country essentially depends, 1st, upon its position, in respect of distance from the equator; 2d, upon its elevation above the level of the sea, and its proximity to the shores of the ocean, or the beds of large rivers, &c.; 3d, upon the geological and mineralogical formations constituting the basis of its soil; 4th, upon the nature of the soil itself, its cultivation, and the vegetable productions by which it is covered; and, 5th, upon the prevailing winds or currents of air. Under these heads are comprised a number of subordinate phenomena, giving rise to important modifications in the climate of a district. In the brief account, about to be given of the subject, the temperature and humidity of a place will be first considered, and afterwards those circumstances which relate more immediately to the nature of its locality.

4. *A. Of the temperature and humidity of climates, and their effects.* — The temperature of a place influences not only the organisation, but also the diseases, of the inhabitants; and, as it varies with the latitude, physical conditions of a district, state of cultivation, &c., it is evident that the physicians of the northern countries of Europe have to treat different constitutions and states of disease, from those which come before practitioners in more southerly regions. The effects of temperature upon the human frame vary remarkably, owing to numerous concurrent circumstances, and the extent, rapidity, and frequency of its changes. The mean annual heat, the extreme range of temperature, not only during particular seasons, but also in each month; the usual mean of such month, and daily variation; have altogether a manifest influence upon the human frame. Geographers have divided the globe, in relation to its temperature, into arbitrary divisions, well known as the torrid, the two temperate, and the two frigid zones; but the climate of the countries placed within these divisions are so greatly modified by other circumstances than by distance from the equator, especially by elevation above the level of the sea, by distance from the ocean, want of cultivation, &c., that many places within the temperate zones, and even in those parts of them which are the nearest the meridian, experience, particularly at one period of the year, remarkably low ranges of temperature; whilst others, much further removed from the equator, are subjected, during summer especially, to as great heat as places within the tropics. In countries or districts near the ocean, or large lakes and rivers, and particularly in islands or places partially surrounded or indented by the sea, the extremes of heat are moderated, but the air is moist, and the changes of season are uncertain and variable; whilst in those situate far inland, and removed from lakes or the beds of large rivers, the range of atmospheric temperature is very great, particularly in latitudes above 40° north, or in places considerably elevated above the level of the sea; and the air is remarkably dry. Even in countries within the tropics remote from the ocean, or having high ranges of mountains placed between them and it, that may attract and condense into clouds and rain the moisture carried by the sea winds over the land, the dryness of the atmosphere is very great, and, where the currents of air have passed over extensive tracts of arid country, is even extreme. This is well shown by the Harmattan winds, which, having blown over the dry countries of central Africa, visit its western coast, and change the extreme humidity of that part, during their continuance, to a state of remarkable dryness. In the more inland districts, therefore, of large continents or islands, placed without the torrid zone, the depression of the thermometer during their winter months, and elevation of it in summer, are greater than is indicated by their distance from the equator, and the air is much drier than in places otherwise circumstanced. In these latter, particularly insular situations, &c., the climate is more equable but much more humid. In the former the seasons are regular, the change constant and rapid; in the latter they are variable, irregular, their accession slow, and attended by storms and hurricanes.

5. The intensity of the *solar beams*, and consequently of *light*, in warm countries, is very influential in modifying not only the vegetable and animal creation which inhabit them, but also many of the physical phenomena which contribute to the constitution of their climates. It would seem as if the solar beams were decomposed by the soil and its products, and, whilst furnishing heat and light to objects upon the surface of the earth, served to supply or to replace the locomotive electricity, which is constantly circulating through, and actuating, not only the crust of the globe, but also the vegetable and animal creations which cover it; passing thence, at last, into the atmosphere. Observation has clearly shown that electrical phenomena are most energetic, and of most frequent occurrence, in countries and in seasons in which the solar influence is the greatest; and that, while dryness of the atmosphere causes its accumulation in objects placed on the surface of the globe, a moist state of the air favours its passage thence, and its excessive increase in the clouds, giving rise to various meteorological phenomena. In a dry atmosphere, particularly in inland districts, thunder and lightning,—the more violent electrical changes occurring in this fluid,—do not take place; whilst vegetables and animals, as well as other bodies, placed on the earth's surface, are more than usually charged with electricity; whereas, in a warm and moist atmosphere, especially in maritime or insular situations within the tropics, these phenomena are very frequent, and the electricity is rapidly carried off from the earth.

6. It is evident that the annual quantity of rain in a particular district is very intimately connected with the nature of the climate; depending as it does upon the sources and amount of evaporation, and the prevailing winds. In the middle countries of Europe, the annual quantity of rain usually ranges from 12 to 18 inches. In the south-east side of this island, and in the vicinity of London, it commonly varies from 20 to 25 inches; whilst it is nearly double this amount in the western parts of Great Britain and Ireland; the greatest quantity falling in July, when the mean monthly temperature is highest, and the smallest quantity in February and March. As we advance towards the equator, the annual quantity of rain increases, chiefly in maritime countries, and parts in which ranges of high hills or mountains skirt the sea-coast, and varies from 80 to 120 inches. But the number of dry days is increased, particularly in districts situate inland; the greatly augmented quantity of rain falling at a particular season, and in a much shorter space of time than in colder regions. In cold or temperate maritime places, on the other hand, the rain descends in slighter showers, and much more frequently, although in much less quantity; leaving fewer dry, and occasioning more foggy and drizzling, days than in warm or inland countries.

7. *B.* Besides the foregoing, there are other circumstances which concur in forming the climate of a place. The chief of these are, the *nature of the locality*, the *soil*, the *abundance and exuberance of the vegetable creation*, the *state of cultivation*, the *prevailing winds*, &c. In the consideration of the *locality*, elevation above the level of the ocean, proximity to its shores, the vicinity of large rivers or lakes, the condition of the surface, its elevation into hills or mountains, or depression into valleys or ravines, and the state of vegetation and cultivation, are the chief features that require notice. Places inland, which are elevated high above the sea, or the banks of large rivers or lakes, have their mean temperture diminished, in proportion to the elevation, much below those which, although equally far removed from the equator, are situate near the level of the ocean, or the bottoms of valleys; and the inhabitants thus breathing a drier, purer, and cooler atmosphere than in these latter localities, are more athletic, less subject to febrile diseases of a malignant or severe character, and reach more advanced ages. The influence of elevation above the level of the sea, and other circumstances of locality, upon the health of man, is chiefly shown in warm climates, and the more southerly of temperate countries. In the north of Italy, and in various districts in the south of Europe situate on the sea-coast, near the banks of lakes and rivers, and in low or narrow valleys, where a deep, moist, and rich soil abounds with organic substances in a state of decay, the air is humid, loaded with effluvia; is much more stagnant and dense; and, although the heat is moderated, as respects the extremes of its range, much within the limits to which it advances in elevated and inland parts, yet is it more oppressive, the atmosphere frequently being sultry and relaxing. Hence it is, that in these low situations the human frame is imperfectly or weakly constituted; a small proportion of the children born are reared; visceral and glandular diseases abound; and the mean duration of human existence is much shorter than in adjoining districts, which are either more highly elevated, or removed from the sources of contamination; and, from these districts, the diminution of the population of the former, continually occuring, is chiefly supplied. The East and West Indies, and the coasts of South and North America, furnish numerous illustrations of the influence of locality upon the climate, and thereby upon the constitution and health of the human race. So very different is the climate of Vera Cruz, and places in the vicinity, from other parts in the same latitude, but situated some hundred feet above the level of the sea, that the comparatively robust and healthy inhabitants of the latter are more subject to the endemic fevers of the former localities, when they visit them, than the natives; a continued residence having impaired the susceptibility of the inhabitants of the former places.

8. In the consideration of the soil, the geological and mineral relations of the place can scarcely be overlooked. In general, the older formations of rocks, and those of a homogeneous and compact nature, support a finer, a more deep, and more absorbent soil than the sandstone rocks and others, the *débris* of which form a coarse and gravelly substratum, through which the rain percolates and flows off, it not being retained in the surface to be evaporated, carrying with it into the air a portion of decayed vegetable and animal matter, as in the case of clayey, deep, absorbent soils, that yield by evaporation nearly all the rain which falls upon them. Whilst deep, rich, and moist soils, particularly near the banks or embouchures of rivers, on the shores of lakes, on

the sea-coast, and near its level, or in low confined valleys, or at the bases of mountains, especially in countries within 40° of the equator, are very productive of malaria; dry, sandy, or gravelly soils, somewhat elevated above or removed from the mouths and banks of rivers, and covering level, gently undulating, or moderately hilly places, are most salubrious. In northern and temperate regions, maritime places are equally healthy with inland districts, or even more salubrious, unless the latter be considerably elevated, possess a dry, well-cultivated soil, and be without marsh lands in their vicinity. But in warm climates, and even in many temperate countries, during warm seasons, places on or near the sea-coast are more productive of insalubrious exhalations than inland districts, owing not merely to their being more nearly on a level with the sea, and subjected to a denser and more moist atmosphere, but chiefly to the circumstance of the soil in such localities being more deep, rich, and absorbent; more liable to inundations from heavy rains or swollen rivers, and from the sea itself; more fertilised by the decay of vegetable and animal bodies; and hence more productive of the elements of unwholesome exhalations, when their extrication is favoured by a hot sun, and their retention and accumulation in the air are promoted by its more constant and greater humidity. Ravines, deep valleys, marsh grounds, the banks of rivers liable to exposure after inundations, the banks of lakes or canals similarly circumstanced; a soil profusely covered by succulent plants and other vegetable productions, and not reclaimed by cultivation, or but recently cultivated; grounds and soils exposed to the action of the sun, after having been long covered by an exuberant vegetation; the cultivation of rice, or other vegetable productions, which require occasional inundations or profuse irrigation; the partial admission of sea water, or its percolation through the natural embankments thrown up by the waves in low swampy parts of a coast; and the accumulation of dead vegetable or animal matter, of ordure, &c., in ditches, sewers, or drains, &c.; are the principal sources of those vapours and gaseous emanations which, being extricated by heat, and dissolved in the moisture of the air, act unfavourably upon the human constitution, and originate several of the most fatal diseases to which it is liable.

9. *C.* The *cultivation* of a country has also a marked influence upon the state of its climate. A district covered by a rank and exuberant vegetation — by extensive forests — is cold and moist, if situate beyond the tropics, its temperature and humidity being many degrees lower than that which a state of high cultivation would produce. A country similarly circumstanced within the tropics is also cooler and more moist than if it were cultivated; but the air is remarkably close and oppressive; and teems, as well as the soil, with the lower grades of animal creation, to the generation and nourishment of which its abundant wild vegetation chiefly contributes. Whilst the wooded and uncultivated districts of high latitudes occasion coldness and humidity of the atmosphere, abound in miasms from decayed vegetable matter, and produce the diseases usually proceeding from these causes, especially intermittents, catarrhs, rheumatism, pulmonary affections, &c., places covered by an exuberant vegetation within the tropics, particularly those near the sea-coast, and upon its level, abound with the effluvia arising not only from vegetable matter constantly in a state of decay, but also from animal exuviæ, and the dead of myriads of insects and reptiles which infest these localities, and occasion malignant and remittent fevers, dysentery, and diseases of the abdominal viscera.

10. Although cultivation renders a climate warmer, drier, and more salutary, especially in temperate countries, yet for many years after the soil is cleared from its more bulky vegetable productions, and when it is first exposed to the action of the sun, especially in low latitudes, its endemic diseases often become more severe than even previously, and not infrequently assume an epidemic or pestilential form. The medical history of the West India islands and adjoining coast of America, as well as of the United States, furnishes numerous proofs of this position. The surface of the earth, previously in a great measure protected from the action of the sun's rays by the thick and exuberant vegetation that covered it, and the temperature lowered by a freer evaporation and transpiration from the leaves, yielded a less noxious effluvium than when entirely exposed to the sun's rays, and to the free action of air heated many degrees higher by the exposure. In its unreclaimed state, the noxious exhalations proceed chiefly from the decayed vegetable matter covering the soil, a great portion of which seldom rises above or extends beyond the higher foliage of trees; in its cleared state, the emanations are the product of the earth itself, and result from its richer constituents, and those elements of animal and vegetable matter with which a deep absorbent soil abounds, particularly in warm countries. The exhalations from the former source are more constantly and uniformly generated; but, from the latter, they are only occasionally formed, and require a concurrence of circumstances, especially a high range of temperature, a situation but little elevated above the sea, the vicinity of the sea-coast, and probably a certain degree of humidity of the air, and peculiar state of its electricity, for their generation.

11. *D. Prevailing winds* have much influence upon a climate. In Great Britain, and most countries forming the north-west of Europe, northerly and easterly winds are frequent during March, April, and May, owing to the current established to replace the warmer air, as it rises from the surface of the Atlantic and more southerly countries, now warmed by the sun as it passes to the northward of the equator. These winds are generally dry and cold, precipitating the moisture in fogs, and occasioning catarrhal, bronchial, pulmonary, and rheumatic affections, and, under certain circumstances, agues. During summer and autumn, southerly and westerly winds are most prevalent, and the air is more moist, owing to the temperature of the inland countries of Europe being now greater than the surface of the Atlantic; and to the air, loaded with exhalations from the ocean, rushing to replace the strata which are constantly rising from the heated surface of these countries, and depositing the moisture in the form of showers, &c. as it passes over the land; the hills, mountains, and places in their vicinity, which first attract the

clouds formed by the exhaled moisture, experiencing the greatest fall of rain. During November and December, northerly and easterly winds are again frequent, and the fall of rain is much increased. As the atmosphere receives or dissolves a portion of those fluid or gaseous substances with which it comes in contact, it is obvious that currents of air passing over the sources of the insalubrious exhalations enumerated above (§ 8.), will be more or less fraught with them. On the other hand, the air readily imparts a portion of those foreign substances dissolved in it, when brought in contact with bodies differently circumstanced. Hence it follows that prevailing winds, whether in northern, temperate, or warm countries, will have considerable influence on the climate, particularly in these last, for there the winds are generally most regular and constant, especially at certain seasons: places experiencing the sea breezes, and the winds which have passed over a dry and well cultivated country, being favourably circumstanced; but those exposed to currents of air from the sources of disease already referred to, being not much more fortunately placed than if they were immediately surrounded by insalubrious localities. In the case of towns, villages, or dwellings, thus situate, ill effects may be partly guarded against by planting double or treble rows of tall trees in such a manner as to intercept the noxious exhalations in their passage from the places in which they are generated. In this way the ancients protected their villas and towns from malaria; and it has been shown in modern times, that the foliage of trees attracts and absorbs these exhalations as they circulate through it, particularly at the season when they are most abundantly extricated from the soil.

12. Maritime places, in warm climates, and the more southerly of temperate countries, whilst they experience in the day-time, during the greater part of the year, regular sea breezes arising from the current of air replacing that which has been rarefied by the heated surface of the earth, are also subjected to land winds during the nights, owing to the less rapid evaporation and greater heat of the surface of the ocean at this time, the rapid radiation of heat from the soil soon reducing the temperature of its surface below that of the ocean in the same latitude. These winds are often fraught with effluvia, which, having been exhaled during the heat of the day into the upper regions of the atmosphere, are at night precipitated to its lower stratum, and are very productive of disease in those exposed to them. The currents of air that during the heat of the day passed from the ocean more or less loaded with moisture, return to it in the night, charged not only with humidity, but also with terrestrial emanations; thus rendering places situate in the vicinity of the sea, and nearly upon the same level, more insalubrious than the elevated districts inland. Numerous places in the East and West Indies, South America, and Africa, furnish illustrations of this principle, as well as various districts in North America, and in the south of Europe, particularly those on the shores of the Mediterranean.

13. *General view of the subject.*—From the foregoing, therefore, it will be seen that the word *climate* embraces not only the temperature of a country, and the phenomena which depend upon the distribution of heat, but all the modifications of the atmosphere by which our organs are sensibly affected, particularly states of humidity, variations of barometric pressure, changes of electric tension, the admixture of gaseous emanations or substances dissolved in the atmospheric moisture, clearness and serenity, and tranquillity as respects both horizontal and vertical currents. All these exert a powerful influence, not only upon the developement and health of the vegetable and animal structures, but also upon the sensations, the intellectual endowments, and the moral emotions of mankind, in the different regions and zones of the world. Comparatively few of these atmospheric changes can be ascertained otherwise than by a long series of attentive observations; and these have been made only at a few parts of the earth's surface; and hence, as remarked by an able writer, though we know with some precision the general circumstances which modify the distribution of heat, we are still imperfectly informed as to the influence of local causes of deviation from the mean state that would be attained if the surface of the earth were perfectly regular, and its power of absorbing and emitting heat and light were every where the same. Europe and Asia are contrasted with each other in respect of many of the circumstances which affect their climate. In a general view, Europe may be regarded as being almost a peninsula, broken, moreover, and intersected by numerous arms of the ocean and inland seas. Owing to the causes already alluded to (§ 11.), the predominating winds are from the west, and these, for the whole of the western portion of this quarter of the globe, are sea winds softened by passing over a mass of water, the temperature of the surface of which, even in the month of January, under the mean parallels of 45 or 50 degrees, does not fall below 48° and 52° of Fahrenheit. Europe has also the advantage of being placed to the north of immense tracts of tropical land, which, by its diurnal radiation, produces effects very different from an equal superficies of ocean. Masses of heated air are constantly rising from the arid surface to the higher regions of the atmosphere, and are impelled towards the colder countries of the north. On the northern side of this quarter, circumstances are unfavourable to the accumulation of extreme cold; for a very small portion of land is placed beyond the polar circle, and the whole northern extremity is separated from the polar ice by an open sea, the temperature of which is very much higher than that of a continental country in the same latitude. The comparatively high temperature of the sea on the north of Europe is chiefly to be ascribed to the direction of the great oceanic valley which separates Europe from America, and the existence of the gulf stream; the intertropical Atlantic waters flowing from the Gulf of Mexico into the polar seas.

14. The circumstances which thus contribute to render the climate of Europe mild, do not exist in respect of Asia, or even of America. Their northern boundaries extend to the winter limit of the polar ice. The north winds, unobstructed by any chain of mountains, blow with unmitigated fury over icy plains extending northward to the pole, and eastward to the point of maximum cold, which, according to Humboldt

and others, seems to be situate near the meridian of Behring's Straits. The refrigerating effects of these winds are not counterbalanced by burning deserts on the southern side of these continents; or, as respects Asia, by any great extent of land placed below the equator; consequently the Asiatic countries situate in the temperate zone, more especially, are not warmed by ascending currents of heated air, such as those which arise from the deserts of Africa, and are so beneficial to Europe. The position of the great mountain chains of Asia, and the elevation of the country, also contribute to diminish the temperature, they presenting a barrier to the warm winds from the equatorial regions. Elevated plains and groups of lofty mountains accumulate and preserve the snow till late in the summer, and give rise to descending currents of air, which cool the circumjacent countries. Asia, moreover, in the whole extent of Europe, has no sea on its western side; consequently the west, or predominating winds, are, for the greater part of this quarter, land winds; and their severity is increased by the great enlargement of the land towards the north. These circumstances occasion remarkable differences in the climates of Asia and the western countries of Europe. The eastern part of the latter, however, nearly assimilates with the western districts of the former; and, with the whole of it, to the north of the 35th degree of latitude, has a climate in which the temperatures of summer and winter are widely different from the mean temperature of the year. At Moscow (lat. 55° 45′), where the mean temperature of the year is only 40° Fah., the mean temperature of the hottest month is 70½°; while at Paris (lat. 48° 50′), 7° farther south, where the mean temperature of the year amounts to 51°, that of the hottest month is only about 65½°. In no part of the world, not even in Italy or Madeira, do finer grapes come to maturity than at Astrakan, on the borders of the Caspian; and yet at the same place, or even still farther south, under the latitude of Avignon and Rimini, the thermometer falls in winter to 18° and 22° below the freezing point. On the western coast of France, in the latitude of 48°, the mean temperature of the year is the same as at Pekin, the latitude of which is only 40°; while the temperature of the winter months is 14½° higher in the former.

15. The mean temperature under the equator is not precisely determined; but Humboldt thinks it does not exceed 80° of Fahrenheit. The greatest summer heats are found in countries contiguous to the tropics. On the Red Sea, for instance, and in Arabia, the thermometer is often seen to rise to 110° at mid-day, and to remain at 94° during the night. A few degrees within the tropics, the sun at midsummer continues for a considerable time to pass daily very near the zenith; and the day, increasing with the latitude, is longer than under the equator; so that the amount of nocturnal radiation is diminished. Among the local causes which contribute to give an excessive temperature to the Arabian peninsula and the north of Africa, the sandy surface almost deprived of vegetation, the constant dryness of the air, the direction of the winds, and the quantity of heat radiated from earthy particles carried about in the atmosphere, are the most prominent.

16. II. Influence of Climate on the Human Constitution. — From what has been already adduced, the action of climate on the human frame must be admitted to be extremely complex; the ultimate result arising chiefly from the combined operation of heat, light, electricity, atmospheric pressure, the various emanations arising from the soil, and the productions, vegetable and animal, constituting the food of man. The human species is, in many respects, moral as well as physical, moulded by the climate and soil which he inhabits; and, by this pliability of his functions, under the influence of atmospheric and other vicissitudes, is the only animal that is truly cosmopolite. In considering the influence of *climate on man*, it will be advantageous to view it, *first*, with reference to extensive communities and races of the species; *secondly*, as respects the nature of the food which different climates provide for the uses of man, and its co-operation with the climate in modifying the human frame, and counteracting the effects of rigorous seasons, and the unfavourable influences to which it is exposed in arctic and tropical regions; and, *thirdly*, as regards the changes produced in individual constitutions after migrating from one climate to another. Neither the limits nor the scope of this work will permit me to consider these subjects in all their relations; I must, therefore, confine myself to such topics as have an evident and important bearing upon practical medicine — in respect either of the causation and nature of disease, or of rational methods of cure.

17. i. Climate in relation to the Varieties of the Species and their prevailing Diseases. — Although man is more readily assimilated with particular climates than any other animal, yet this faculty is not equally possessed by all the varieties of the species and the natives of every latitude. It is more particularly manifested by the inhabitants of temperate climates; probably owing to their greater vital energy, and to their habitual exposure to alternate extremes of temperature and of season. The natives of polar regions on the one hand, and of tropical countries on the other, possess it in a much less remarkable degree; and not only are they speedily cut off by removal from the one climate to the other, but they often suffer greatly from a residence in temperate countries. It should not, however, be overlooked, that man, like many of the individuals below him in the scale of creation, often derives advantage from a change of locality; provided that the change is not made to opposite climates, but to districts of equal or greater salubrity.

18. It has long been a matter of dispute whether the differences, intellectual and physical, presented by the various races of man, have arisen from the continued, slow, and imperceptible operation of climate; or have been originally impressed upon the species. The evidence and arguments connected with this subject fall not within my province. But it is of importance to the practical physician to note what those peculiarities are, that characterise the different races of man; and, whether they be the result of climatorial influence or of original conformation, to consider them in connection with the climates to which we find them more particularly appropriated in our survey of man in his distribution over the globe.

However cursory this survey may be, there are certain facts of the utmost practical importance to every one who entertains philosophic ideas in medicine, which should not be overlooked; namely, that the slow and continued operation of a particular climate actually changes the human frame in many respects to that state which its indigenous inhabitants present; and that the constitution, thus assimilated, is necessarily the best suited to the external influences to which it is exposed, and the food furnished by the soil of which it is the native. There are, however, certain characteristics, especially those which distinguish the Æthiopian and Mongolian varieties, that a succession of ages has not been sufficient to impart to different races which had migrated to the climates they inhabit; and which must, therefore, be imputed to original conformation.

19. *A.* The *effects of great cold*, and of the *privation of solar light*, during nearly two thirds of the year, upon the human frame, are observable in the stunted growth and the weak muscular power of the Samoïed, the Ostiaks, the Esquimaux, the Greenlander, and the Laplander, compared with the inhabitant of temperate climates. In the arctic regions, the human body, like many of the lower animals, and the productions of the vegetable kingdom, rarely reaches that state of developement it presents in temperate countries: the features and stature retain an appearance of boyhood or youth, almost until marks of age appear; the complexion is greyish; the head flat, the face broad, the eyes far apart, and the whole figure squat and unattractive. Female pubescence, however, according to the accounts given by Linnæus, Humboldt, Lyon, Parry, and Franklin, as indicated by the accession of the catamenia, is not delayed beyond the period usual in temperate countries — most probably owing to the premature excitement of the generative organs in the unrestrained intercourse of the sexes, that takes place at an early age. To this cause, also, is to be imputed the circumstance of their females being less prolific than those of temperate climes; whilst, in these races, the instinctive feelings which tend to the preservation of the individual and of the species are sufficiently strong, the intellectual endowments and moral sentiments are remarkably torpid. The benumbing influence of cold, and of the privation of solar light, is also manifested in the functions of the nervous and sanguiferous systems. Diseases generally assume among them an asthenic form; fevers being of a low type, and sthenic inflammations of rare occurrence. As long as the natives of arctic regions remain in their own countries, they are exposed to but few causes of disease besides cold, the scarcity of provisions, occasional excessive repletion, and various contagions. The soil being almost constantly frozen, even during summer, at the depth of a very few feet, deleterious emanations seldom or never issue from it; but infectious maladies, when once introduced, become extremely destructive, and several of them often very prevalent, owing to their low, small, and unventilated dwellings, and their want of personal and domestic cleanliness. When, however, they migrate to more temperate and southerly regions, they are very liable to febrile and sub-inflammatory diseases, arising from increased temperature, the vicissitudes of season, and other novel causes to which they become exposed: whilst their maladies seldom require, their constitutional powers can but ill tolerate, a lowering treatment, or large sanguineous depletions.

20. *B.* Although extreme and continued depression of temperature produces the above effects, more moderate cold, particularly when alternating with a temperate summer heat, promotes the developement of both the body and mind. Countries situate between 45° and 63° of northern latitude are inhabited by the most robust and enduring of our species, in respect of both physical and intellectual powers. It may be stated in general of the northern temperate zone, that the inhabitants of its more southerly countries have made the earliest advances in civilisation, and that those of its middle and more northerly climates have carried the useful arts and sciences to the highest perfection. Within the range of this zone, man presents the greatest diversity of temperament, of constitution, and mental endowment. Muscular frames, plethoric habits of body, and the sanguine temperament, predominate among the natives of the more northerly of temperate climates, particularly as regards Europe and its western countries. Affections of the chest and respiratory organs, inflammations, fevers complicated with inflammations of the lungs or of the brain, and rheumatism, are the most prevalent diseases. Epidemics assume most frequently amongst them a phlogistic character: and vascular depletions are more required, and better borne, in the treatment of their maladies. Climates which are the most variable, as to both the commencement and the course of the different seasons, are, notwithstanding the many disadvantages imputed to them, the most favourable to the advancement of the various bodily and mental powers. The rapid and frequent vicissitudes of weather preclude, as respects the community generally, the regular adoption of means to guard the body against their operation: consequently the frame becomes habituated to their operation, and thereby fortified against the injurious impressions which would be otherwise made by them. That countries thus circumstanced are benefited rather than injured by this state of weather and season, is shown by the robust frames, the mental activity, and the longevity of their inhabitants. The physical and moral history of the British Isles, Denmark, Sweden, and the more continental districts of western Europe, demonstrate this fact. In the eastern countries of this quarter of the globe, as well as in Central Asia and in North America, the seasons being much more regular in their advent and in their course, measures are more regularly and uniformly adopted to moderate the extremes of temperature and the vicissitudes of weather; and these have, in many instances, the effect of enervating the frame, of promoting the extension or prevalence of disease, and of thereby diminishing the mean duration of human life. Of this description is the use of excessively warm clothing, and of stoves, which overheat the air of the apartments, without renewing it so rapidly as is often requisite to the wants of the economy. Hence, whilst the external atmosphere is cold, dry, and invigorating to the healthy frame in a state of activity, the air in-doors is close, warm, and depressing; the frequent alternation from

the one to the other, or the constant residence in the latter, being injurious even to those in health, and causing diseases of the thoracic and abdominal viscera.

21. While the natives of northerly inland countries suffer more especially from the extremes of temperature and of season, and the circumstances which arise out of them, they are less exposed to emanations, arising chiefly from the decomposition of vegetable and animal matter — to those endemic sources of disease that produce so much suffering and mortality in low or level districts, and in more southerly climates, where the atmosphere is moist and warm. The inhabitants of temperate countries considerably elevated above the level of the sea, and of mountainous places, are generally of a spare, firm, and muscular habit of body, and strongly formed; chiefly owing to their active and industrious modes of life, and the pure and light state of the air they breathe. The irritable, sanguine, and nervous temperaments, and quick, irritable, and generous dispositions; predominate among them. Inflammatory, hæmorrhagic, and spasmodic diseases, particularly hæmoptysis, bronchitis, consumption, asthma, inflammations of the lungs and pleura, rheumatism, and disorders of the circulatory organs, are most common. Their females are more virtuous and prolific, and the mean duration of human life longer, than amongst the natives of lower districts and warmer climates.

22. *C.* There are certain peculiarities in the natives of temperate countries, particularly of European countries, that must strike the pathologist as intimately connected with the nature and treatment of their diseases. These are chiefly the complexion of the skin, the large developement of the respiratory, biliary, nervous, and circulating organs, compared with those of the natives of intertropical countries. The skin of the dark races is not only different in colour, but is also considerably modified in texture, so as to enable it to perform a greater extent of function than the more delicately formed skin of the white variety of the species. The thick and dark *rete mucosum* of the former is evidently more suited to the warm, moist, and miasmal climates of the tropics, than that with which the latter variety is provided. The skin of the negro is a much more active organ of depuration than that of the white. It not merely exhales a larger proportion of aqueous fluid and carbonic acid from the blood, but it also elaborates a more unctuous secretion, which, by its abundance and sensible properties, evidently possesses a very considerable influence in counteracting the heating effects of the sun's rays upon the body, and in carrying off the superabundant caloric. Whilst the active functions, aided by the colour, of the skin, thus tend to diminish the heat of the body, and to prevent its excessive increase by the temperature of the climate, those materials that require removal from the blood are eliminated by this surface, which, in the negro especially, performs excreting functions very evidently in aid of those of respiration and of biliary secretion. In the white variety of the species, on the other hand, the functions of the lungs and liver are much more active than in the darker races, changes to a greater extent being performed by respiration in the former than in the latter, as I have proved by experiment. The liver is also larger, and its secretions more copious in the European than in the negro or Mongol.

23. In the inhabitants of northern climates, and elevated or cold countries, the functions of the lungs and kidneys are extremely prominent, and those of the skin and liver much less so; eliminating or depurating actions on the blood being performed chiefly by the former organs. But, in the natives of intertropical climates, the skin assumes, as shown above (§ 22.), a more extensive function, and, by its activity, compensates for the diminished operation of the lungs, liver, and kidneys, generally observed among them, aided, no doubt, by the secretions from the intestinal mucous surface. In temperate countries, the various emunctories of the frame present a degree of activity in strict keeping with this general connection of climate with the developement and activity of these functions. In the warmer districts of temperate climates, and especially in those which are subjected to a dense, moist, and miasmal atmosphere, the changes produced by respiration are diminished, and those effected by the cutaneous and intestinal mucous surfaces are increased. If the natives of such districts belong to the white variety of the species, their cutaneous surface not being constituted so as to enable it to perform the compensating action for which the skin of the darker races is destined, a different organ performs this office, and the liver assumes an increased action, combining and eliminating several of the effete constituents or elements as they accumulate in the circulation, and thereby giving rise to an increased and modified biliary secretion.

24. *D.* If we compare the organisation and functions of the negro (and I may add, of the Mongol) with those of the European, the following general results will appear, and, together with what has been now advanced, will serve as the source of very important pathological and therapeutical inductions: — The circulating organs, the lungs, the liver, the middle and anterior lobes and convolutions of the brain, the muscles, and the bones, excepting those of the head and face, are very evidently smaller, and their functions less prominent, in the former than in the latter variety; whilst, on the other hand, the skin and its functions are much more developed. With the activity of function, conjoined with frequent exposure to the action of numerous excitants, the disposition to, and occurrence of, disorder increase; and, accordingly, diseases of the lungs and circulating organs, of the liver, and of the nervous system, predominate in the white races of man; and chronic affections of the skin, and those acute maladies which chiefly attack this surface and the intestinal mucous membrane, in the dark varieties of the species. Amongst the latter, fevers are not common; and when they occur, they are usually slight, terminate speedily, seldom assume an inflammatory or continued type, often pass off with critical discharges from the skin or bowels, and not infrequently lapse into a state of low or chronic dysentery. The exanthematous diseases generally assume in them a severe and asthenic form, and rapidly spread by infection. Verminous disorders are very common in them; but affections of the brain and its membranes, and of the teeth, are extremely

rare; the cranial contents seldom suffering materially in the course of febrile attacks. The remarkable thickness of the bones of the head, in nearly all these races, protect the membranes and brain from the causes of disorder to which they are liable; and the continued exposure of the head to the action of the sun and air, the absence of mental culture, and their modes of life, by no means dispose these parts to disease. Inflammations, particularly those of a sthenic character, are very rare; and, if vascular excitement attend the early stage of these maladies, it soon exhausts itself and passes into the opposite extreme. Disorders, which consist chiefly of morbidly increased discharges, from deficient tone of the extreme vessels, and those of a spasmodic form, are not uncommon.

25. *E.* The organisation of the dark races of man, chiefly as respects the state of vascular action and tone, the developement of the viscera already referred to (§ 22—24.), their food, modes of life, excessive addiction to venereal indulgence, the continued influence of a moist and miasmal atmosphere, and the characteristic features that their diseases consequently assume, generally preclude the employment of large vascular depletions. During the progress of febrile and exanthematous maladies, critical evacuations from the skin and intestinal mucous surface frequently occur, the latter of which are very apt to assume a colliquative or chronic state, and, if not judiciously controlled, to carry off the patient. Hence the propriety of employing free evacuations of the *prima via*, with warm diaphoretics, at the commencement of their diseases, and of supporting the energies of life in the advanced stages. The circumstances now referred to as modifying the constitution and diseases of the dark races of our species, should never be overlooked when devising plans for treating them. Nor should the fact be neglected, that worms, especially lumbrici, in the intestinal canal, are very frequently connected with the origin of many maladies of remote but related organs. Affections of the stomach, diarrhœa, colicky pains, leucorrhœa, various spasmodic and convulsive disorders, chronic dysentery, &c. very often arise from this cause; and, no more than the cause itself, will ever be permanently removed, in these races especially, by evacuations alone, but by combining them with stimulants, tonics, and antiseptics. Although both the habits and modes of living of the dark races, and the constitution of their digestive organs, require the occasional use of active purgatives, in order to remove the saburra and colluvies which so rapidly collect on the intestinal mucous surface, yet those medicines should generally be combined or alternated with substances which exert a cordial and tonic influence, as their vital energies soon sink under frequent evacuations when deprived of an accustomed or requisite stimulus. (See *Art.* Disease.)

26. ii. Of the Food of Man in relation to Climate and the Constitution of the Varieties of the Species. — The intimate relation which subsists between the food of man, and the nature of the soil and climate which he inhabits, and the combined operation of both upon his constitution and the character of his diseases, have seldom been considered in a manner deserving of the subject. Man, although in some measure independent of the nature of the soil or climate in which he lives, is yet, in several points of view, the creature of both. His manifestations, both moral and physical, are moulded by both influences, like the animals which are below him in the scale of creation, although generally in a much less degree. It is the soil that furnishes him food, and the air which he respires derives much of what is noxious to his frame from that source. Whenever, therefore, the natural history and diseases of man come under consideration, they should be viewed in relation to those productions of the soil on which he subsists — with which, in many respects, he may be considered as a fellow product, but holding a superior station, and by which are often caused many of his ailments. As it is beyond the scope of this work to enter fully into the very interesting considerations which this subject involves, I can only point to its more general connections; and I do this more with a view of directing the attention of others to the subject, than of satisfying my own wishes as to its discussion.

27. As the physical and intellectual powers of man enable him to occupy the whole surface of the globe, it follows that he cannot be restricted to any particular kind of food — in other words, he must be naturally omnivorous, as a consequence of his ubiquity. If the wastes of Lapland, the shores of the icy sea, the frozen coasts of Greenland, and the deserts of Terra del Fuego, were destined by nature for the habitations of man, then is he not an herbivorous animal; nor is even a mixed diet necessary for his support. It would be impossible to procure vegetable productions where the earth's surface is almost constantly either frozen or covered with snow. The continual use of animal food is as natural and wholesome to the Esquimaux, as a mixed diet is to an Englishman. The Russians who winter on Nova Zembla, according to Dr. Aiken, imitate the Samoïeds, and eat raw flesh and drink the blood of the reindeer, in order to preserve their health in these arctic regions. The Greenlander devours, with good appetite, the raw flesh of the whale, or the half frozen and half putrid flesh of seals; and drinks the blood of these latter animals, or regales on dry fish and whale-oil.

29. Within the tropics, man is subjected to the continued operation of a high temperature, which excites the nervous functions and vascular action, notwithstanding the provision with which nature has furnished his integuments in order to moderate the animal heat. This provision, as we have seen, consists chiefly of the dark colour of the *rete mucosum*, which speedily gives off the superfluous heat of the body, and of the great activity of the perspiratory functions (§ 22.). Intertropical countries, particularly such as are low or swampy, while they abound with the productions of the vegetable kingdoms, and with numerous swarms of insects and reptiles, maintain very few of those gregarious animals which serve as food; and thus, we perceive that their inhabitants, unless in elevated and cool situations, as in Abyssinia, Mexico, &c., are obliged, by the scarcity of these animals, to subsist on vegetable productions, and to adopt a system of religion, which, while it tends to prevent the entire destruction of the more useful species, is sufficient

to restrain their numbers within their appropriate means of subsistence, and without encroaching on or impairing the supply of food with which the vegetable creation furnishes man. Hence, in many places of intertropical Africa, the lower animals, whose numbers are few, are occasionally made sacred by the priests for a time; and in other places of this continent animal food is very rarely enjoyed. In Hindostan, the natives are almost debarred from the use of flesh meat; and the cow is made sacred, evidently to prevent the destruction of a species, whose milk furnishes man with one of the chief articles of diet.

29. But nature provides a more suitable aliment to the inhabitants of those climates. The date, the palm tree, the cocoa-nut, the sago tree, the plantain, the sugar-cane, and the banana; the yam, cassava, ground-pea, and other roots; a great variety of refreshing fruits; and, more particularly, the very abundant production of nutritious grains, especially the Indian corn and rice, richly supply the natives of these climates with wholesome food. The general and necessary adoption of a vegetable diet within the tropics, from the exuberance of the vegetable creation, and the comparative scarcity of those gregarious animals chiefly destined for the use of man in cold and temperate regions, is necessary to the existence of the human species in the higher ranges of temperature, and in the more unhealthy districts in hot climates. The adoption of animal diet exclusively, or of too large a proportion of it, disposes the human frame, when exposed to the influence of tropical heat, to those diseases which arise from endemic causes, — viz. the decay of vegetable and animal matters, the exhalations of marshy and absorbent soils, and other emanations accumulated in moist and close situations; and to those which affect the alimentary canal and other abdominal viscera. Various epidemic diseases also often produce their greatest havoc, and assume pestilential characters, amongst those, who, to the predisposition occasioned by a high range of temperature, have superadded that arising from a too full animal diet. It appears to be a salutary law of nature, that, in those climates, where animal food would be detrimental to the human race, there the animals usually destined for the purpose are few in number, and stunted in growth. The localities, indeed, which are the most destructive to man, are also the most inimical to these animals, which, if they were chosen as the chief article of food, would both dispose to disease and increase its fatality. Thus it appears, that the distribution of the classes of animals over the surface of the globe is so apportioned, and certain of their orders and genera so restricted to particular latitudes and climes, as to be subservient to the wants of man, without becoming hurtful, or endangering his existence in countries in many respects unfavourable to his bodily and mental developement.

30. While the vegetable diet, which the hottest and most unhealthy climates furnish, is the least liable to excite the nervous system, or to overload the circulating and secreting organs, or to irritate and inflame the excreting viscera, it serves to promote endurance, and, with the hot spices which grow spontaneously in the same localities, to counteract the contaminating changes produced in the body by the vegeto-animal effluvia to which it is frequently exposed. In both Indies, and in intertropical Africa, the inhabitants of low and moist situations live almost exclusively on rice and maize; with these they consume, as a condiment, a very large quantity of the hottest spices, the stimulating and tonic qualities of which preserve them from the effects of the diminished temperature and terrestrial emanations during, and after, the rainy seasons and monsoons, and in some measure from intestinal worms and other parasitic animals. To these spices, even the feathered creation, and the lower animals, occasionally resort, especially during the unhealthy seasons. Were the inhabitants to live chiefly on animal food, and use the strong fermented liquors made in colder climates, the nervous and vascular systems would be inordinately excited, irritability being thereby soon exhausted; and they would be as much disposed to, and affected by, disease, as unseasoned Europeans, who, partly owing to these causes, so soon become its victims, after having removed to low, moist, and hot situations between the tropics. Nature adapts her productions in every climate to the necessities of man; and appropriates them to his real, but not his imagined wants, — to his state of constitution, as modified by the operation of soil, air, and temperature; and nowhere is this provision more manifest than in warm countries. There, if the causes of disease be most energetic, as they most indisputably are, she has chiefly restricted them to those which proceed directly from the soil and the climate, while she has confined those arising from the nature and the abuse of food within narrow limits; as there man is destined, by the circumstances already alluded to, to live chiefly on a vegetable diet, and is liable only to occasional deficiency of its supply. But even the inflictions which nature thus imposes on the inhabitants of these climates are accompanied by abundant means of preventing their invasion, or arresting their progress. The most unhealthy situations not only abound with suitable means of subsistence, but also present spontaneously the most efficacious prophylactic and curative agents for the diseases that are endemic in them. Thus rice, the banana, the plantain, the juice of the cocoa-nut and of the palm, the oil of the palm-nut, &c., are the most wholesome articles of food in the districts wherein they are most abundant. The low grounds on which these are produced abound with deleterious miasms; and the stagnant water, which there often serves for the necessities of life, contains the ova of insects and animalculæ. While the former occasion agues and remittents, the latter gives rise to diseases of the digestive canal, and to the generation of worms; and both causes combine to produce fevers, diarrhœa, dysentery, cholera, visceral obstruction, &c. In the above localities grow the different species of the *capsicum*, — the principal condiments employed by the natives; and these are also the chief prophylactics and remedies for their constitutions, against the diseases now alluded to. By the side of the palms and the cocoa-nut grow the different species of the tamarind and the croton, which are, respectively, the mildest and most cooling aperient, and the most active cathartic. Thus nature provides an antidote to the bane which is imposed on the inhabitants of

unhealthy warm climates, and, by adopting the indications she presents, they are enabled to exist without suffering much more from disease than the natives of temperate countries, or having the allotted span of human existence much abridged. It is in no small measure owing to his persisting in the diet, beverages, clothing, and modes of living, suited to a cold or temperate climate, and to which he had become accustomed, that the European is liable to disease when he has removed to a hot country. When travelling in the most unhealthy parts of intertropical Africa, in 1817, I met with an Englishman, who had lived there between thirty and forty years, and was then in the enjoyment of health. The circumstance was singular; and, in answer to my enquiries as to his habits, he informed me, that soon after his removal to that pestilential climate his health had continued to suffer, when, after trying various methods without benefit, he had pursued as closely as possible the modes of life of the natives, adopting both their diet and beverages, and from that time he had experienced no serious illness.

31. In countries approaching the poles, where the continued low temperature, and the want of solar light during two thirds of the year, tend to diminish nervous and vascular energy and tone, and to lower the whole circle of vital actions, nature has furnished man with those articles of food which are the best calculated to nourish, to stimulate, and impart vitality to the frame, and thus to enable it to bear up against the rigour of the seasons, and the injurious influence of the climate. Without such food, the inhabitants of arctic regions would fall a prey to diseases of debility, and the higher latitudes would soon become entirely depopulated. In these, as well as in northerly and elevated parts of temperate countries, nature spontaneously provides man with those substances which are the most energetic, both as preventives and as remedies of those diseases which arise from the influence of climate. The various species of pine abound in the coldest regions, and furnish, in numerous forms, the most efficacious internal and external medicines, and even the most wholesome beverages in these maladies. Hæmorrhagic diseases, low fevers, asthenic inflammations, scorbutic and cachectic affections, the extreme effects of cold upon the extremities, &c., are most successfully prevented or treated by the judicious use of terebinthinate preparations. This observation is also applicable to the *arnica montana*, and other alpine plants.

32. The temperate zone, whilst it furnishes in its wide range the greatest diversity of climate — in some localities that of the tropics, in others that of arctic regions — provides man with the greatest abundance of animal and vegetable food: thus enabling him to combine both, or to adopt more or less of either, according to the nature of the seasons, of the climate, and the particular circumstances in which he may be placed. Nature is always provident: she takes sufficient care that each particular district or country shall have within itself, or be capable of producing by requisite labour, those articles of food which are most appropriate to the climate, and thereby the most wholesome to its inhabitants. When commerce or manufactures increase the population of a district beyond the means of sustenance derivable from the soil, and lower animals, in the vicinity, the food which is obtained from a similar climate is generally the most wholesome. Various disorders originate from the introduction, from remote countries, of unsuitable articles of luxury into diet; and not a few arise from the improper mode of preparing food, which would otherwise be wholesome. Thus, the hot spices and the high-seasoned dishes, which, during the tropical rains, would be beneficial to the natives of those climates, who live chiefly on vegetable diet, frequently are productive of disease amongst those who partake too freely of animal food, or the high-feeding inhabitants of commercial cities. The adoption, also, of highly seasoned dishes, with an undue quantity of flesh meat, — undue, because exceeding the wants of the economy, and the circumstances of the climate, — and the use of spirituous and fermented liquors, are fertile sources of disease, particularly fevers and affections of the abdominal viscera, among Europeans residing in warm places or during warm seasons.

33. From these and other considerations the following corollaries may be drawn: — That the climate of a country should, in a great measure, guide man in his selection of food; those productions which are most abundant around him being most appropriate to the circumstances in which he is placed: and that the nature of his food thus conspires with the climate to modify his constitution, whilst it serves to counteract the rigours of season, and the unwholesome influences to which he is constantly exposed in very hot as well as in very cold countries.

34. iii. Of the Effects produced on the Human Constitution by Change from one Climate to another of a very different or opposite Description. — By referring to what has been already advanced respecting the physical relations of climate, and the circumstances more immediately connected with cold and warm countries respectively, and by connecting these with the peculiarities characterising the races of man inhabiting both, we shall readily perceive that a most important revolution will take place in the animal frame from the change, in whichever direction it may be made; and that such revolution will be great in proportion to the suddenness and greatness of the change; it being in either case attended with more or less febrile commotion or other diseased action.

35. 1st. *Of change from a cold or temperate to a warm climate.* — *A*. Keeping in view the following characteristics of a cold and temperate climate — viz. its low temperature, the alternations of season, the pureness of the atmosphere, the more nutritious, invigorating, and stimulating nature of the food, and the effects of warm clothing — and connecting these with the vascular plethora, the active functions of the brain, lungs, liver, and kidneys of its inhabitants, the disturbances which will result when they are subjected to a continued high range of temperature, and to an atmosphere loaded with moisture, and frequently with vegeto-animal effluvia, may be anticipated. It is now fully ascertained that the effects of a high range of temperature, and of moist miasmal air, on the European constitution, are, a diminution of the changes effected by respiration on the blood, an increase of the secreting and excreting functions of the liver and skin, and a decrease of the urinary excretion. When, therefore, the plethoric

European migrates to an intertropical country, the functions of the lungs and the pulmonary exhalation become diminished; the requisite changes are not effected on the blood, notwithstanding the excitement of the nervous and vascular systems by the increased temperature; and the already active and developed liver is irritated, and has its functions augmented, by the increase of those elements in the blood, that the lungs and skin cannot remove from it. Hence proceed febrile attacks, particularly when excited by their appropriate causes; inordinate activity, with a relative frequency of the diseases, of the liver; the secretion of acrid bile; and the disorders especially affecting the alimentary canal and excreting organs. The general adoption of too rich and nourishing food and beverages by those who remove from cold to hot climates, tends greatly to increase these evils, as already explained (§ 30.); and the influence of high temperature and of a vertical sun upon the European head is productive of disease both of it and of the liver. To these effects, the mental cultivation and activity of Europeans somewhat predispose them; whilst their heads are not so well guarded from external influences by the constitution of its integuments and hair, and the thickness of the cranial bones, as those of the negro and Mongol varieties of our species.

36. The obvious indications resulting from these facts are, that natives of cold countries migrating to warm climates should, particularly if the change has been made abruptly, live abstemiously, and promote the functions of those organs which perform the most essential part in excreting effete or injurious elements from the circulation. The head should be kept cool, and protected from the rays of the sun; the surface of the trunk and lower extremities ought to be preserved in a freely perspirable state, so as to take off the load of circulation, and derive from the excited liver. In order to promote the secreting and depurating functions generally, active exercise, short of fatigue, should be taken, without exposure to the causes of disease, particularly those which are endemic. As the maladies which most frequently supervene on change from a cold to a warm climate proceed neither from the increased temperature alone, nor from greater moisture of the air, but from these conjoined with malaria, and not infrequently also with wide ranges of temperature during the twenty-four hours, especially in high and inland localities — with hot days, and cold, raw, and dewy nights, and with a too full and exciting diet and regimen, causing fevers, dysentery, and diseases of the biliary organs — care ought to be taken to avoid those causes, as well as whatever may tend to assist their operation on the frame, and to protect the system against the sudden daily changes by warm clothing at night, &c.

37. *B.* The consideration of the effects produced by *migration, during a state of disease,* from a cold to a warm and moist climate, is of the utmost importance. Keeping in mind its influence upon the healthy frame — chiefly in exciting the functions of the skin and liver, and diminishing those of the lungs — we are led to prescribe it in the treatment of various diseases. In *hæmoptysis,* this change is obviously beneficial, especially as a warm and moist atmosphere, by this mode of operation, lessens the activity of the pulmonic circulation and the disposition to sanguineous exudation from the surfaces of the bronchi. *Bronchitis* and *tubercular phthisis* are also often benefited, and the progress of the latter much delayed, by this state of atmosphere, especially when adopted early. *Chronic rheumatism* is sometimes cured by this change, seemingly owing to its influence in promoting the biliary and cutaneous functions. *Dropsies,* particularly *anasarca* and *hydrothorax,* have been, in a few instances, removed by a change to a warm climate; but whilst a moist state of the air is most serviceable in pulmonary and hæmorrhagic diseases, dry warmth seems more beneficial in dropsies, dyspeptic affections, and hypochondriasis, evidently from its effects in augmenting the insensible perspiration and the pulmonary exhalation, and imparting tone to the capillary circulation. Besides these, *gout,* in its early stages, *dysmenorrhœa,* and *scrofula* in nearly all its forms, are benefited by a change to a warm, or even a mild and dry, atmosphere.

38. 2d. *Of migration from a warm to a cold or temperate climate.* — This subject should be viewed in relation, first, to the change as it affects the dark races of man; and, secondly, as it respects those belonging to the Caucasian variety, who have either been born or acclimated in warm countries. — *A.* If change from a cold to a warm climate is productive of disease and great mortality in the white constitution, the migration of the dark races to a cold or temperate country is not less fatal to them; and whilst the change produces, in the former case, fevers, diseases of the biliary organs, and of the alimentary canal, it occasions, in the latter, tubercular phthisis, and other tubercular affections, with diseases of the bronchi, &c. When the dark races, particularly the negro, and those of the Mongol variety who are natives of intertropical and low countries, migrate to places subjected to a low range of temperature during a great part of the year, the depressing influence of cold upon the nervous system and vital actions of the lungs and skin, gives rise not only to tubercular formations, but also to increased secretion from the internal mucous surfaces, and they are, in the great majority of cases, cut off, in a few months or years, by diseases of the lungs, kidneys, and bowels. Those, however, who change the climate progressively, or who are born in countries of an intermediate temperature, and who are provided with warm clothing and animal or nutritious diet, suffer much less than those who migrate in a more direct manner, even although possessed of these latter advantages. The native African who removes immediately to Europe seldom lives over two winters in it; whilst the negro who has been brought to the West Indies, and subsequently to the southern states of North America, previously to his arrival in more northern countries, and enjoys necessary food and clothing, will often not suffer materially from the change.

39. *B.* Those who have been born of European parents, or been seasoned in warm climates, not infrequently suffer after removal to temperate or cold countries. Even, although the change may have become necessary from chronic affections of the liver or bowels, yet may it for a while aggravate or render more acute hepatic disorder, or superadd to it disease of the lungs; and many

who have experienced only functional disorders of the stomach or liver, or who acquired merely a tendency to them during their residence within the tropics, have been attacked by active disease soon after their return to Europe. Others, also, who have suffered more seriously, have had their complaints aggravated after a short residence in England, although they were benefited during their voyage home. This result of change to a colder climate proceeds not, however, altogether from the temperature or the state of the seasons, but in a great measure from the imprudence of the patient. Frequently, however, a colder atmosphere is prejudicial for a time, by constricting the vessels on the external surface, and determining an increased flow of blood to the large internal viscera, and thereby occasioning congestion and obstruction of those organs which have been weakened by previous disease or the influence of climate. Another frequent consequence of change from a warm to a cold country is a diminution of all the secretions, particularly those of the skin and liver; originating vascular plethora and visceral engorgement. In this state of the vascular system, if the cutaneous or pulmonary surface be subjected to cold, particularly cold combined with moisture, after the circulation has been determined to these parts by hot rooms and crowded assemblies, or if reaction rapidly follow the impression of cold, the great mass of blood is thrown upon the internal viscera, which, if not relieved by a free secretion, become the seat either of congestion or of inflammation. Hence it is that hepatitis, or dysentery, so frequently follows changes from a high to a low temperature. The remarkable liability to diseases of the respiratory organs, observed in those who have returned to Europe after a long residence in warm countries, is evidently owing, in many instances, to pre-existing disorder of the liver, which has extended thence to the lungs, owing either to the increased action of this latter organ upon removal to a colder climate, or to imprudent exposures to cold, or to breathing a very warm and close air immediately upon coming out of a cold and dry atmosphere.

40. In order to counteract these effects of change, warm clothing, particularly of the lower extremities, with the use of flannel next the skin, should be adopted; and exposures to cold and moisture, and the night air be avoided. The diet ought to be light, and of moderate quantity; the strong wines imported into this country abstained from; and, above all, the functions of the bowels and abdominal viscera carefully watched, and promoted whenever they seem to flag. It may be of importance to know the most suitable period of the year to arrive in this country, after the frame has become assimilated, by a long residence, to a warm climate. If an invalid return in winter, the sudden transition from a warm to a cold country may be detrimental; if early in the spring, he is liable to feel the effects of a variable season for some time. The least objectionable period extends from May to September; and if the cold of the winter months be found too severe in the more easterly counties, or in the metropolis, the climate of Devonshire or of Bath may be tried with as great advantage as that of most of the southern parts of continental Europe. Old residents in a warm climate will experience much advantage from residing some time in the more southerly parts of Europe, before passing to England or other countries of the north, more particularly if they use a course of the warm mineral waters of Vichi, Carlsbad, or Ems, in their way.

41. The children born of white parents resident in the more unhealthy countries within the tropics, very generally die at an early age if they be not removed to a colder climate. They commonly sink from the *choleric form of fever* described in a separate article as incidental to infants; or from diarrhœa, dysentery, or diseases of the abdominal secreting viscera, often assuming a remittent form. When, therefore, either of these appears in this class of patients, removal to a temperate climate should be advised when it can be effected; taking care to guard them, by warm clothing, &c., from vicissitudes of temperature for a considerable time after the change, and attending to the first indication of pulmonary or tubercular disease, or disorder of the liver and bowels.

42. III. Of the particular Localities which are beneficial in Disease, or of Climate as a Therapeutical Agent. — In this part of the subject I shall consider, *first*, the different parts of Great Britain which may be suitable places of residence for invalids; *secondly*, those in the south of Europe and the Mediterranean; and, *thirdly*, those in the Atlantic and West Indies.

43. i. *Climate of certain places in England.*— The chief difficulty in this country is to find a mild and sheltered climate for invalids from pulmonary disease; and it is almost exclusively to the south and south-west parts of the island, in the immediate vicinity of the sea, that we must direct our enquiries. The general use of coal fires in all the large towns in Great Britain, owing to the quantity of sulphur this mineral contains, and of sulphuric acid fumes and fuliginous matter generated, renders the air more irritating to the lungs, and increases the risk of a winter residence in these places, to all those who suffer from, or are even liable to, diseases of the respiratory organs. This, together with other considerations — especially the results of observation — renders it imperative on the medical attendant to recommend removal to a more salubrious locality. The mild situations I shall notice are in the south, the south-west, and the west of the island.

44. *A.* The *south coast* is much milder and more moist than the east and inland parts of the island, during the months of November, December, January, February, and March; but from April till October the temperature of the latter is greater. On this part of the coast, *Undercliff*, in the Isle of Wight, *Hastings*, and *Brighton*, have been recommended as winter residences for invalids. *a. Undercliff* is the most sheltered and mild of these places in winter, and its air softer and more humid in summer than either. *b. Hastings* is sheltered, during the winter and spring months, from the north and north-east winds; and, of the various places on this part of the coast, ranks next to Undercliff as a residence for invalids with pulmonary affections, *c. Brighton* is more exposed than the foregoing to the north and north-east winds, and its air is drier, and hence more bracing. It is therefore

great service. In prescribing the mineral waters of any of those places, due reference should be had to the nature of the climate; and, on the other hand, when directing change of climate, some attention should be paid to the waters which the place may afford; as the appropriate use of the one, whilst the patient is experiencing the influence of the other, will materially promote the end in view.

50. In a very great proportion of cases, where the state of the patient admits of change of locality, much advantage will accrue from passing the autumn on the south coast of the island, as at Brighton, Hastings, or Undercliff, after having passed the summer at the foregoing watering places. In general, when the digestive and generative organs are disordered, frequent change of air, and travelling by easy and short journeys, with gentle exercise, particularly on horseback, agreeable amusement, and regular habits, will prove of marked advantage, and greatly aid medical treatment.

51. ii. *Of the Climate of certain parts in France.* — *A.* The *West* and *South-west of France* furnishes several places, the climate of which possesses the softness and humidity which are requisite in pulmonary diseases. The mean annual temperature of the south-west of France is stated by Dr. J. CLARK to be 4° higher than that of the south-west of England; and the climate of both generally agree or disagree with the same diseases. — *a.* That of the south coast of Britany is mild during the winter, and temperate in summer, the mean temperature of this province being about 56½°. Its climate is soft and relaxing; and it is hence suited to dry bronchial irritations, to hæmoptysis, and tubercular cases. LAENNEC found it very favourable to consumptive patients, and states that the proportion of such in this part of France is very small. In scaly eruptions on the skin, dysmenorrhœa, and in irritable habits of body, this climate will be often of service.

52. *b. Pau,* situated at the base of the Pyrenees, from the account of it given by Dr. CLARK and Dr. PLAYFAIR, appears to be the best place in the south-west of France for invalids; and yet, in no respects is it superior to the south-west of England in consumptive cases. Its air is still and mild in winter and spring; the chief advantage it offers being the great mildness of its spring. Dr. CLARK gives the following comparison: — Its *mean annual* temperature is 4½° higher than that of London, and about 3° higher than that of Penzance; it is about 5° lower than that of Marseilles, Nice, and Rome; and 10° lower than that of Madeira. In *winter*, it is 2° warmer than London, 3° colder than Penzance, 6° colder than Nice and Rome, and 18° colder than Madeira. But in the *spring*, Pau is 6° warmer than London, and 5° warmer than Penzance; only 2½° colder than Marseilles and Rome, and 7° colder than Madeira. The range of temperature between the warmest and coldest months at Pau is 32°; this at London, and likewise at Rome,i s 26°; at Penzance it isonly 18°, and at Madeira 14°. The daily range of temperature at Pau is 7½°; at Penzance it is 6½°; at Nice, 8½°, and at Rome, 11°. Pau is drier and warmer than the south part of England in the spring, and northerly winds are less injurious. One of its chief advantages is its vicinity to the watering-places among the higher Pyrenees, which are often beneficial places of summer residence to those who have passed the winter and spring at Pau.

53. *B.* The *South-east of France.* — The climate of the tract of country extending along the shores of the Mediterranean, from Narbonne and Montpellier to the Var, is warmer and drier, but more exciting, than that of the south-west. It is subject to sudden vicissitudes of temperature, and to cold winds, especially the north-west, or *Mistral.* It is decidedly prejudicial to consumptive patients, especially when the disease has made some progress, and to irritative affections of the stomach, trachea, or larynx; and is serviceable chiefly in diseases of debility and relaxation unattended by inflammatory or hæmorrhagic action.

54. Dr. CLARK ranks the principal places on the coast of Provence in the following order, as residences for invalids: — Hyères, Toulon, Marseilles, Montpellier, Aix, Nismes, Avignon. — *a. Hyères* possesses the mildest climate on this part of the coast, being sheltered from the north winds by a range of hills; and its inhabitants being comparatively exempt from pulmonary affections. *b.* At *Marseilles* the climate is dry, variable, and subject to cold irritating winds. It is therefore injurious to consumptive patients; and is one of the places in France where pulmonary diseases are most prevalent. Invalids requiring a dry air, and capable of bearing cold winds, may be benefited by residing here for some time. *c. Montpellier* has obtained a reputation for salubrity to which it has no claims. According to MM. FOURNIER and MURAT, more than a third of the deaths that occur in the hospital of this city are from pulmonary consumption. The prevalence in this part of the country of northerly winds during winter and spring, both accounts for the frequency of pulmonary diseases, and points out its unfitness as a residence for patients thus affected. *d. Aix* is still more exposed than Montpellier to the Mistral and north winds, and pulmonary complaints are very prevalent among its inhabitants.

55. *C. Nice,* although situate on the same line of coast as Provence, enjoys a much milder climate than any part of that province. It is protected by a lofty range of mountains from the north winds; and the daily range of temperature is there less, than at almost any part of the south of Europe. During winter the weather is settled, and the atmosphere clear, the thermometer seldom sinking to the freezing point, excepting at night. At this season, however, as well as in the spring, cold dry winds are not infrequent; and the climate is, upon the whole, dry and exciting. Hence it is not favourable to pulmonary consumption, — the very disease for which it was formerly very improperly recommended. It is likewise unfavourable to irritable or inflammatory states of the larynx, trachea, and bronchi, attended with scanty expectoration, or hæmoptysis. But chronic bronchitis, bronchorrhœa, and humoral asthma, are generally very much benefited by the climate of Nice. It is also serviceable in all cases of debility, torpor, and relaxation of the mucous surfaces; in chronic rheumatism, gout, external scrofula, dyspepsia, and hypochondriasis.

56. iii. *Of the Climate of Italy and Mediterranean.*—*A. Genoa* is not favourably noticed by Dr. Clark as a residence for invalids; but Dr. Johnson, on the authority of Dr. Mojon, speaks of it in more favourable terms. It is best suited to those affected by chronic bronchitis, and dyspeptic and gouty complaints; and to persons of relaxed and phlegmatic habits of body. *Pisa*, *Rome*, and *Naples* are the other places in Italy most frequented by invalids. The climate of Pisa nearly resembles that of Rome, the latter being somewhat warmer and drier in winter. Dr. Clark considers the climate of Rome as one of the best in Italy for consumption, unattended by hæmoptysis. For those, however, who cannot take exercise in the open air, and must confine themselves to sheltered situations, the Lung' Arno in Pisa is the best place of residence to be found in Italy. The climate of Naples is considered by this writer, as well as by M. Lasnyer, more exciting than that of the two foregoing places; and it is more subject to high winds. The diseases which a residence in either of these three cities will benefit, are those above enumerated. Persons who remain in Italy during the summer, will find Lucca, Sienna, and the vicinity of Naples, the coolest situations.

57. *D.* There are various other places on the shores and islands of the Mediterranean, the climates of which are suitable to invalids; but we possess little or no accurate information respecting them. *Malaga* in the south of Spain, *Cagliari* in Sardinia, and some parts on the coast of Sicily, afford a mild winter climate, but the difficulty of reaching them, and of obtaining in them many necessary comforts and conveniences, almost precludes invalids from the northern parts of Europe from visiting them. *Malta* is not open to these objections; but, according to Dr. Hennen, the quantity of dust raised from its arid soil, and suspended in the air, during dry weather, renders it an unsuitable climate for consumptive patients. A considerable number, also, of the inhabitants die of pulmonary diseases. In his work on the medical topography of the islands of the Mediterranean, Dr. Hennen states a fact, which is perfectly in accordance with my observation in warm climates, although doubted by Dr. Clark, viz. that those of the *Ionian Islands, which are decidedly most malarious and remarkable for remittents, have had fewest pulmonary affections amongst the British troops.* In respect of the health of the troops stationed in these islands, this writer states, that, from an average of seven years, phthisis has borne a proportion to other complaints of 1 to $198\frac{1}{4}$ only. At *Malta*, on an average of eight years, consumption has occurred in the proportion to other maladies of 1 to $93\frac{1}{2}$. Including all pulmonic complaints whatever, the proportion to others, as regards the Ionian Isles, has been 1 to $20\frac{3}{4}$; and, as respects Malta, 1 to 14. Taking into calculation the whole Mediterranean islands, the proportion of pulmonic, to other diseases, has been 1 to $17\frac{1}{4}$ in the British army.

58. iv. *Climate of the Northern Atlantic.*—Under this head the climates of *Lisbon*, *Cadiz*, *Madeira*, the *Canaries*, the *Azores*, *Bermudas*, and the *Bahamas*, may be arranged; all of which have been recommended to persons requiring a soft and equable climate, during the winter and spring.

59. *A. Madeira* is, of all these places, indisputably the best, as respects both the climate, and the comforts and conveniences within the reach of the invalid. The frequency and excellency, also, of the means of conveyance to and from the island are no small recommendations. From the minute account furnished of the climate of this island, by Drs. Gourlay, Heineken, and Renton, after a long residence in it, and from the effects I have observed in several persons who had resorted to it as a winter's residence, it may be justly concluded, that it is superior to any part of the south of Europe for consumptive cases. Its central ridge of mountains gives it, in summer, a cool land wind; and the north trade winds, at this season, render it temperate and salubrious. During winter and spring, Funchal, and parts near the sea-shore, are the best places of residence; and, during summer, the more elevated situations in the interior are cool and agreeable. The mean annual temperature of Madeira is about 6° higher than the south-east of France and Italy; and the heat throughout the year is much more equably distributed. The winter of the former is 12° warmer than that of the latter, and the summer 5° cooler. At Madeira the extreme annual range is only 14°; whilst it is double this amount at Pisa, Rome, and Naples. In respect also of the progression and steadiness of its temperature, it excels those places. Rain falls at Madeira on 73 days of the year, and at Rome on 117 days, and chiefly during the autumn in the former. The air is also more soft than at Rome.

60. *B.* The *Canaries* possess the next best climate to Madeira. The mean annual temperature, however, of Santa Cruz, the capital of the former, is 71°; whilst that of Funchal, the capital of the latter, is only 65°. The summer temperature of Santa Cruz is 7° warmer than that of Funchal, and the winter temperature 5° warmer. Hence the mean annual range of temperature is greater in the Canaries than in Madeira; which possesses, in other respects, advantages sufficient to recommend it in preference to the former in pulmonary diseases.

61. *C.* The *Western Islands*, or Azores, enjoy a climate nearly approaching to that of Madeira. They are, however, more subject to high raw winds, particularly those from the north and north-west, which are often very cold and harsh; and the temperature of winter is lower, and that of summer higher than in Madeira. The air is also more humid. From a very short visit I made to Madeira and the Azores, — to the former in the spring, and to the latter in winter, — I should conclude the Azores to be much inferior to Madeira as a residence for invalids, chiefly because of the absence of many necessary comforts and conveniences, of their stormy winters, and the infrequency and ineligibility of the opportunities of transport between them and this country. The climate of the *Bermudas* and *Bahamas* presents no advantages sufficient to obtain for them a preference to those already noticed. They are liable to storms, and to harsh northerly winds in winter, from the American coast, whilst their summers are very hot.

62. v. *Climate of the West Indies.*—The mean annual temperature of the West Indies, at the level of the sea, is 79°, 80°, and 81°; and during the

winter months, in some places, about 3°, and in others only 2° lower. The extreme annual range is 20°, and the mean daily range about 6°. This continued high temperature exhausts the energies of invalids; and the clearness of the skies, and great power of the sun, prevent suitable exercise in the open air. A visit to the West Indies of a few months' duration, made either to some of the most healthy islands, or passed chiefly aboard ship, will, however, prove of service in several chronic affections, particularly those referred to above (§ 37.), excepting consumption in its more advanced stages. Persons much disposed to this disease, either hereditarily or by the conformation of the chest, &c., or who are threatened by its early stages, will find a removal to the West Indies one of the prophylactic measures most to be depended upon. When residing some time in an extremely malarious place within the tropics, I observed that the most healthy persons in it were those who were constitutionally disposed to pulmonary disease. But I believe, that the observation often made, is perfectly correct, that removal to an intertropical country, when phthisis is far advanced, will only accelerate its progress. It may also be stated, that severe and protracted catarrhs are very common upon entering between the tropics. In gout, chronic rheumatism, scrofula, and calculous affections, a residence in the West Indies is often productive of advantage.

63. vii. *Of residence on the sea shore and voyaging.*—There are certain topics connected with change of climate often discussed during the course of practice, viz. whether are inland situations, or places on the sea-shore, whose climates are physically alike, most serviceable in pulmonary diseases? and whether or not sea-voyages possess any advantage over a land residence in these complaints. *a.* In respect of the first question, it may be stated, that places on the sea-shore are generally more humid than those inland, and oftener, on this account, preferable in the dry and the hæmorrhagic pulmonary affections; whilst a situation somewhat inland, or not removed above a few miles from the coast, seems somewhat more serviceable in those cases of consumption which are otherwise characterised. But the question has not been satisfactorily determined, and, indeed, is not easy of solution.

64. *b.* With reference to the second question, it may be stated more confidently, that sea-voyaging, in a suitable climate, is preferable to land residence in the early stages of phthisis, and particularly when it is attended by hæmoptysis. This advantage is evidently to be attributed to the influence of the ship's motion on the sanguineous and nervous systems. This opinion was argued for by Dr. Gregory, in his excellent thesis, *De Morbis Cœli Mutatione Medendis,* and has been generally admitted. Cruising in a warm or even temperate latitude, particularly in the Atlantic, is preferable to voyaging, because of its longer duration. Whilst the sun is north of the equator, the climate between the 30th and 50th degree of latitude; and while the sun is south of the equator, that from the 20th to the 35th or 40th degree of north latitude, will be found the most salutary. During winter, voyages between Madeira and the West Indies; and, in summer, between Madeira and this country, in the vessels constantly trading between England and the West Indies, and which generally touch at Madeira, might be undertaken with advantage. These vessels furnish tolerable accommodations, which may be easily improved or adapted to the state of the invalid.

65. *A.* When the winter has been passed in any of the warmer situations noticed above, attention ought to be paid to the time of returning to this country. This should not be earlier than the first, or later than the last week in June. If the invalid have passed the winter in the south of France or in Italy, these places may be left early in May, and he may travel cautiously through Switzerland, avoiding exposure to the evening and morning air. During the journey, warm clothing should be resorted to as soon as the temperature falls so low as to become sensibly cold; and a free circulation in the skin and extremities ought to be carefully preserved.

66. *B.* With respect to the diseases which are benefited by change of climate, it is unnecessary to add any thing at this place, as the climates which seem most serviceable are noticed when discussing the treatment of those diseases in which most advantage is derived from removal to particular climates. The affections for which this treatment may be employed, are *scrofula, tubercular disease of the lungs, hæmorrhage from the lungs,* &c., *chronic bronchitis, asthma, chronic rheumatism, dyspeptic* and *hypochondriacal affections, urinary calculi,* and various *cachectic* and *hydropic affections.* (See *the treatment of these complaints in their respective articles.*)

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COLD. — (Classif. Pathology. *Ætiology* and *Therapeutics.*)

1. Cold is merely a relative term, expressing a sensation produced by the abstraction of heat by any substance of a lower temperature than that of the body or part which feels; consequently this sensation is not always occasioned by the same degree of temperature. Nature has recourse to various means for abstracting animal heat from the body, under circumstances requiring it; and for preventing the dissipation of it, under other circumstances; and the instincts and reason of the animal creation are often evinced in furthering these objects. The dark skin of certain varieties of our species, and the thin hairy covering of many of the lower animals inhabiting hot countries; the fair well-clothed skins, and the thick coverings of wool or fur with which those of cold climates are provided; and the construction of the dwellings, &c. in different and opposite climates; are all provisions intended to accelerate, under certain circumstances, and to delay, the dissipation of animal heat under others.

2. The functions of the living economy can be performed within a certain range of temperature only, for any considerable time. Above or below this range, they will more or less rapidly cease, according to the extent to which the change may be carried in either direction, and the rapidity with which it is effected. Whilst the abstraction of heat is produced more rapidly than it is supplied, either in a part or in the whole body, depression of the vitality takes place co-ordinately with the rapidity of the loss of temperature; but, on the other hand, when the abstraction of heat is altogether prevented by living in a medium of equal or greater temperature, excessive vascular excitement, rapidly exhausting the sensible and irritable properties of the tissues, and thereby terminating human existence, is the consequence. The heat of the human body seldom varies, in health, above 100° or below 96° of Fahrenheit's thermometer; and although man may live in a lower temperature than the zero of this scale, when suitably fed and clothed, owing to the activity of the respiratory and heating functions, yet, in consequence of the nature of these functions, he cannot exist for any considerable time in a mean range of temperature above that of his own body. In no part of the globe is the mean annual range of atmospheric heat within twelve degrees so great as that of the living frame.

3. i. Physiological and Pathological Effects of Cold. — *A. A general view of its effects.* In considering, therefore, the effects of cold upon the body, due reference should be had to the state of the respiratory and heating functions, which are essentially vital, and active in proportion to the greatness of the constitutional powers. The abstraction of caloric, or cold, when carried far, first depresses, and afterwards annihilates, the vital actions of a part, by depriving it of that principle which is necessary to preserve the various tissues composing it in a suitable state for reciprocity of action, and which observation shows to be necessary to the healthy performance of the sensiferous and circulating functions especially. When heat is abstracted to a greater extent than it is supplied, sensibility is diminished or numbed; and circulation, as respects both rapidity and size of the current in the vessels, is lessened. This effect may be produced in a part or extremity to the extent of annihilating these functions in it, whilst in the internal viscera they either remain entire, or are but little changed. When this is the case, the part affected will permanently lose its vitality, if these functions be not soon restored by frictions, and a very gradual admission of heat. A part thus affected by cold is said to be frost-bit, — an accident to which the more exposed parts of the body are liable in very depressed states of temperature. Even friction only may occasion too quick a change of temperature, if it be not made with some substance, as snow, which may prevent the too sudden increase of heat, and the risk of immoderate reaction. When the vital energies are weak, a less degree of cold will depress them than when they are energetic; and, upon its removal, vascular reaction will be less apparent, or even not at all supervene. If cold be not great, or too long applied, relatively to the vital energies, increased action, as evinced by a glowing sensation, follows its impression. When, on the other hand, it is excessive, either in degree or continuance, the depression of vital power, especially the manifestations of this power in the nervous and circulating organs, is co-ordinate, the living animal sinking into a state of torpidity from which it is with great difficulty roused. Thus cold, momentarily or briefly applied, when the constitutional powers are not very much impaired, proves, if not excessive, an excellent invigorating or tonic agent, owing to the re-action which follows; but when acting energetically, or for too long a time relatively to the state of those powers, it will produce one of two effects, according to the circumstances attending it, or following its application: either it will depress the vital actions beyond the power of recovery, the system sinking into a comatose state, or struggling between this state and partial or irregular reaction; or it will be followed by increased or even uncontrollable vascular action, soon exhausting the vital manifestations of the vessels and the irritability of the frame, or of the part principally exposed, and occasioning dissolution of the blood. While the continued action of that degree of cold, which may be endured for a short time, very often produces the former result; the momentary exposure to excessive cold, or the injudicious application of heat in an inappropriate or too rapid a manner, after the more moderate but prolonged action of this agent, is usually followed by the latter. Inflammations are not infrequently induced in this manner in the organs to which cold has been directly applied, as in the case of inflammation of the lungs coming on after passing into a warm apartment

immediately from a cold atmosphere. In other cases, the impression of cold when prolonged, although moderate, may, by diminishing vital action in the parts on which it acts, so determine and increase it in distant or even opposite parts or surfaces, as to give rise to inordinate secretion or vascular action in the latter. Such being the more general effects of cold upon the system, it will be advantageous to examine its mode of operation more closely, in order that we may be enabled to form accurate ideas as to its influence in the causation and removal of disease.

4. *B. Particular effects of cold.* — *a.* The *primary effects* of the abstraction of heat from a part, to the extent of producing a decided sensation of cold, appear to be exerted upon the *nervous system*, whose sensibility and vital manifestations it lowers, and, when excessive, entirely annihilates. These effects are obvious in both the organic and voluntary classes of nerves; and are at first attended by an alteration of their sensibility of a slightly painful kind, often followed by loss of their functions. Thus, cold will occasionally give rise to local paralysis. When an intensely cold substance is applied to a living tissue, the rapid abstraction and passage of its caloric through the living surface intervening between them, cause similar effects to those following the rapid communication of caloric by a heated body, and thereby momentarily excite the nerves and vital turgescence of the intervening parts. Thus, intense cold will produce vesication, inflammation, &c. of the skin.

5. *b.* The action of cold, when slowly or moderately applied, in diminishing *vital turgescence*, the bulk of the tissues, and the activity of the *circulation*, seems coeval with the effects produced by it on the nerves. By this action the small arteries, veins, and secerning pores are constricted, and the communicating canals between the extreme arteries and radicles of the veins are rendered smaller and less pervious. Hence, when cold is applied to the surfaces of the body, the circulation there and in the vicinity is diminished, and the blood is driven thence, and accumulates in the large veins of the internal viscera. Owing partly to this operation, and partly to the sedative effects of cold upon the nervous system, the whole circulation becomes weakened, and congestion of the large vessels and internal erectile tissues takes place. If the impression of cold is only for a short period, the vital energy not being at the time materially deficient, the heart and large vessels are enabled to react upon the load that oppresses them, and an increase of the circulating functions ensues. But when the impression of cold continues, circulation becomes less and less active, with at first slight or inefficient efforts at recovery, and at last ceases entirely.

6. *c. Muscular parts* are very sensibly affected by cold, in consequence of its effects upon the nerves supplying them, and of the diminution of the circulation in them. Nervous energy, therefore, being depressed, and the circulation weak and insufficient, muscular contractions also become weak and tremulous; and the muscles subsequently stiff, or altogether rigid, frequently with cramps or spasms intervening between these states. A share of these extreme effects is, doubtless, owing to the vascular congestion produced on the cerebro-spinal axis, and on the origin of the nerves supplying the muscles. The cramps often occurring after plunging into cold water, or while swimming, are illustrations of the effect on the muscular system of moderate cold suddenly applied to the surface, and of its action thereon, through the medium of the nervous and vascular systems. After the power to make muscular exertion ceases, in consequence of the continuance or increase of cold, remarkable stiffness and rigidity of the voluntary muscles supervene, sometimes extending to the respiratory muscles, and producing asphyxy. In many cases, where cold acts intensely or suddenly upon the surface of the body, rigidity takes place with remarkable celerity, as stated by Quintus Curtius, and MM. Parat, Martin, and Beaupré, to have occurred in the expedition of Alexander, and the retreat of Napoleon from Moscow. Trismus and tetanus have followed, in some cases, a moderate decrease of temperature, and difficult articulation is not an uncommon effect of this cause.

7. *d.* The influence of cold upon the *respiratory* and *calorific functions* is very manifest. When atmospheric cold is moderate, and sufficient exercise is taken in it, and the cutaneous surface and extremities are sufficiently clothed, then respiration is energetic, the changes produced on the blood are complete, and animal heat is freely generated, and is sufficient to supply the continued loss of it from the surface of the lungs. But when cold depresses the nervous power, owing either to its excess, or to the circumstance of its acting simultaneously upon both the cutaneous and pulmonary surfaces, or to the circulation being unaided by muscular exertion, then respiration becomes laborious, quick, and painful; and the production of animal heat is insufficient to preserve the fluids and soft solids in a suitable state for reciprocal action, rigidity, followed by congelation, first of the extremities, and subsequently of more central parts, taking place. As long as the nervous energy and the circulation are unimpaired, animal heat is freely developed; but it becomes co-ordinately depressed with the failure of these, and returns in a proportionate degree with their restoration. When cold has acted for a considerable time upon the frame, animal heat is either restored with difficulty, or it continues to vacillate and sink with the nervous and circulating functions until death supervenes. It is chiefly during the period which elapses between the exposure to cold, and restoration from its effects, that diseased action commences, or is developed. Too long continuance in a cold bath, wet clothes, and numerous other means of refrigerating the body, will produce a loss of temperature that may never be recovered. Dr. Currie found that a man with a temperature of 98°, three hours after cold bathing and exposure to a north wind, had not recovered his natural heat, although warm stimuli, frictions, &c. had been employed. During such states of protracted restoration, various morbid states are apt to originate and to give rise to a train of diseased actions, varying in almost every case with the constitution, temperament, predisposition, and habit of body of the individual. Even after reaction has taken place, some particular organ or part may suffer especially owing to these predisposing circumstances; and inflammation, with effusion, disorganisation, &c. may be the result.

8. *e.* The effects of cold upon the *brain and the organs of sense and voluntary motion,* are similar to those already described. Hearing, sight, touch, &c. become imperfect, the functions of mind impaired, and insensibility, somnolency, delirium, and convulsions supervene. The somnolency, and indifference to the consequences of indulging it, when long exposed to cold, have been well known since the accounts given of the cases of Dr. SOLANDER and Sir J. BANKS, in Terra del Fuego, of MAUPERTUIS in Tornea, and of CAPTAIN PARRY's associates in the north-west expedition. But the fullest description of its effects upon the senses and cerebro-spinal centres is given by BEAUPRÉ. The same degree of cold, according to the state of the system and the extent to which the surface is protected, will cause either delirium of a quiet comatose kind, or raving madness, or convulsions, passing into tetanic rigidity. Great insensibility and somnolency will also often steal upon their victim, without any other mental disturbance; and occasionally they will be preceded by tremors, delirium, and convulsions.

9. *f.* Cold produces very decided effects upon *secreting organs and surfaces.* When it acts directly upon either of these structures, it diminishes or entirely suspends their functions, owing both to its sedative action on the nerves and circulation, and to its constricting influence upon the canals and pores of the part, it thereby lessening vascular turgescence and vital manifestation. Cold air or cold fluids acting upon the external surface interrupt the functions of the skin, particularly if the cold be combined with moisture. A similar effect is produced upon the pulmonary mucous surface, only if the cold be intense, and if it be at the same time humid. As long as the cutaneous surface is protected, and the vital energy of the frame is unsubdued, the exhalation of vapour from the lungs, and the other changes in the blood that take place in this organ, are not materially interrupted until the temperature of the air falls much lower than can be endured by the external surface. When, however, the air is very humid as well as cold, the aqueous exhalation from this organ also is much lessened. The remarkable tolerance of cold by the lungs during exercise and a protected state of the external surface, is evidently owing, 1st, to the circumstance of the quantity of air received at each inspiration being a part only of the whole air contained by them; and, 2d, to the changes in the capacity of the circulating and respired fluids for caloric, by which the respiratory actions are attended. Whilst the nervous and circulating functions are unimpaired by cold, diminution of the cutaneous and pulmonary exhalations is compensated for, and injurious plethora of the vascular system prevented, by a proportionate increase of the secretions from the kidneys and intestinal mucous surface. Owing to this activity of the internal secretions, and centralisation of vital energy, the appetite is also increased — sometimes rendered even ravenous — digestion is accelerated, and the stomach enabled to dispose of substances which would otherwise be rejected from it. When cold acts upon the frame for some time, and is great relatively to the condition of the digestive organs or vital power, a nearly paralytic state of the nerves of the alimentary canal may ensue, giving rise to interrupted secretion, to flatulent dilation of large portions of it, either with or without spastic constriction of other parts, and to painful and anxious suppression of all its functions.

10. *C. Of the effects of cold in various states of the system.* — *a.* It has already been stated that the injurious effects of cold are great in proportion to the depression of vital power at the time of its action. When the surface of the body is warm, or even overheated, but not perspiring, when vascular action is energetic, or the nervous power excited, cold is well and safely borne; but when the body is perspiring freely, and at the same time exhausted, or the depressing mental passions are in operation, it produces a much more intense and rapid effect, not only by obstructing the cutaneous perspiration, but also by occasioning either interruption of the internal secretions, followed by febrile action, or a morbidly increased flow of some one or more of these secretions, according to the state of the body at the time. The experiments, however, of FORDYCE, BLAGDEN, and DOBSON, and the practice of the Russians, show that the free perspiration produced by heated air and the vapour bath, as long as the excitement of the nervous and vascular systems occasioned by these continues, may be checked with impunity, and even give rise to a salutary reaction.

11. *b.* Exposure to cold and wet, in cases of shipwreck, &c., particularly in winter, is productive of bad effects, great in proportion to the rapidity with which evaporation of the moisture from the surface of the body takes place. As the temperature of the sea, in winter, is always higher than that of the air, and is not lowered, as that of the air is, by evaporation from the wet clothes of the person thus exposed, so has it been observed on numerous occasions, and particularly in the instance recorded by Dr. CURRIE, that persons who have remained almost wholly immersed in sea-water have always lived longer than those who were exposed to the refrigerating action either of the wind only, or of the wind assisted by evaporation from the wet surface and clothes. Protracted immersion, also, is not so injurious in salt as in fresh water. This is chiefly owing to the higher temperature of the former than of the latter, and partly, perhaps, to the stimulating effects of the salts dissolved in sea-water on the skin. In cases of shipwreck it is not unusual to find, that those who had taken spirituous liquors to excess during the period of their peril are the first to fall victims to the effects of cold. This, most probably, is owing to the exhaustion consequent upon the excitement produced by spirits; to the fluxion and centralisation of vital power in the parts on which the stimulus directly acts; and chiefly to the circumstance that such excesses cooperate with cold in producing congestion of the vessels within the cranium, and apoplectic lethargy.

12. *c.* During states of morbidly excited vascular action, unattended by free excretion, or a perspiratory state of the skin, the external or internal application of cold is beneficial, by lowering the nervous and vascular excitement to that state which is requisite to a due performance of the secreting and excreting functions. But in order that this effect should be obtained, it will generally be necessary to continue the application of

cold for some time, or frequently to repeat it after short intervals, as reaction usually follows a brief use of it; but as soon as the disposition of the morbidly increased action to recur no longer is evinced, a prolonged application of cold may be injurious by depressing the vital energy so low, that recovery either of the part on which it directly acted, or of the system generally, may be a matter of difficulty. In many of such cases, rigors will follow the too protracted or intense operation of this agent, and be the means of bringing about reaction, which, however, may assume irregular or excessive states, or produce a new or modified train of symptoms.

13. *d.* During the exhaustion following muscular exertion in hot weather, and while the surface is freely perspiring, cold in any way is most intensely and rapidly injurious, particularly when it is applied to the stomach. The ingestion of a large quantity of a cold fluid in this state has been speedily followed by death. This extreme effect has not been satisfactorily explained. That inflammation may be so quickly induced cannot be admitted. It seems more probable that the sudden impression of the cold fluid upon the nerves of the stomach, together with the rapid distension of the organ, paralyses the system of nerves which supplies the digestive organs, and which is evidently that part of animal organisation on which the vital manifestations throughout the frame more immediately depend. Even when cold, owing either to the less bulk of the cooling body, or to the state of the stomach and system at the time, is not quickly or intensely injurious, still it may be productive of injury by favouring the developement of inflammatory action in the stomach or liver, or by interrupting the secreting actions of these and adjoining viscera.

14. D. *Changes observed in cases of death by cold.* — QUELMALZ found the vessels of the brain turgid with blood, and the large veins and arteries filled by polypous concretions; and he refers the sopor preceding death to congestion of blood in the cerebral vessels, and effusion of serum in the ventricles of the brain. ROSEN also observed the vessels within the cranium engorged with blood. CAPPEL states that he found the blood and fluids accumulated chiefly in the pectoral and abdominal viscera. Dr. KELLIE detected, in two cases examined by him, the same appearances as were remarked by QUELMALZ, ROSEN, and CAPPEL; and noticed, in addition, a bloodless state of the scalp, engorgement of the sinuses, integrity of the substance of the brain, remarkable redness of the small intestines from turgescence of the blood-vessels, and absence of tympanitic distension.

15. E. *Of cold, or undue abstraction of animal heat, as a cause of disease.* — Cold is either a predisposing or an exciting cause of a very great number of diseases, particularly among the poor, and during the winter and spring seasons, as J. P. FRANK and Sir G. BLANE have demonstrated. The injurious effects of this agent on infants and children are great in proportion to the earliness of the age at which they are exposed to it. I believe that more than one half of the deaths, and two thirds of the diseases, that occur among the children of the poor, are more or less caused by it. Cold will produce modified and even opposite effects, according to its intensity and duration. It has already been shown, that, during the integrity of vital power, a brief or moderate impression of cold is an indirect stimulant, and an excellent tonic remedy; whilst a very intense or prolonged action of this agent is a direct depriment of the vital energies, even although the rapid abstraction of much cold may inflame and disorganise the parts through which it is caused to pass. Hence it must be obvious that cold will be either a predisposing or an exciting cause of disease, according to the intensity, duration, and manner of its operation, to the constitution of the person on which it acts, and to the other causes and influences which cooperate with it. The same circumstances will also explain the great diversity of its effects, and its operation in determining the characters and complications of numerous maladies, even after their career has commenced.

16. After what has been advanced respecting the physiological and pathological action of cold, I need not add any further observations on the manner in which it operates in the causation of particular diseases. It will be sufficient to enumerate those which it most frequently produces, either by its unaided operation, or in conjunction with a pre-existing disposition or disorder, and with other morbid influences. Fevers, inflammations of the individual viscera, dropsies of the shut cavities and anasarca; catarrhal and bronchitic affections, hæmorrhages; diarrhœa, dysentery, and diabetes; rheumatism and gout; apoplexy and paralysis; tetanus, and other spasmodic and convulsive maladies; the obstruction of secreting and excreting functions — of the bile, of the urine, of the catamenia, and of the intestinal excretions; scrofulous, scorbutic, and chlorotic complaints, hardening of the cellular tissue and œdema, chilblains, and congestions and obstructions of glandular and secreting parts, are among the most common consequences of this agent. Fevers occasioned by cold alone are generally ephemeral, or of short duration, when no particular organ or function is already in fault; and the reaction — generally ushered in by rigors — is of a salutary tendency when kept within due bounds: but cold favours directly and indirectly the spread of typhoid infection; and its action on the frame during the progress of all continued and exanthematous fevers is very often injurious, unless judiciously regulated and employed, and is productive of many of the dangerous complications which frequently arise in their course, as well as of the local affections that appear during or after convalescence from them. Such is more remarkably the case in respect of the exanthematous fevers. Dropsical and hæmorrhagic effusions, although obviously depending, in many cases, on pre-existing organic change, yet often, even in these instances, have been determined by this agent. The greater prevalence also of dropsies, particularly after the exanthemata, in cold than in warm climates; and the paucity of pulmonary, hæmorrhagic, and diabetic complaints in hot countries, ought not to be overlooked. The frequency of dysenteric, tetanic, and spasmodic affections in warm climates is no argument against their production by cold, inasmuch as they there arise chiefly from a relatively great depression of temperature. The

influence of cold in occasioning apoplexy and paralysis, particularly in aged persons, has been long admitted and satisfactorily proved by WEPFER, ZACUTUS, CULLEN, FOTHERGILL, MARCARD, PENADA, WALTHER, THILENIUS, WEBER, and others; and scrofula is almost entirely a disease of cold and moist countries.

17. *F. Circumstances often favouring or determining the injurious action of cold.*—*a. Weakness of constitution* favours the injurious action of cold upon the frame. Infants, convalescents from disease, and aged persons, are more injuriously affected by cold than those in whom the nervous, circulating, and respiratory functions are fully developed and unexhausted, and who are thereby enabled to generate vital heat to supply the loss of it going forward on all the exposed surfaces. *b. Exhaustion by excesses* is one of the most common predisposing states to the injurious operation of cold. The violent or fatal effects of a cold bath at a moment of exhaustion by muscular labour have been well known, at least since the time of ALEXANDER the Great, who nearly perished from this imprudence. The exhaustion consequent upon venereal excesses renders the system remarkably sensible of depressions of temperature, as well as disposes it, in an uncommon degree, to the ill effects usually resulting therefrom. The same remark applies to the depression consequent upon the excitement of spirituous liquors. The habitual indulgence in warm apartments, and sleeping in close chambers, with too great a quantity of clothes on the bed, are very injurious, especially to females. *c.* The *internal determination of the fluids* accompanying certain diseases, as chronic bronchitis and diarrhœa, chronic inflammations of the viscera, cachectic affections, &c., and even that attendant upon a full meal, or the occasional or repeated indulgence in exciting beverages, or the operation of cathartic medicines, favour the injurious operation of cold upon the frame, particularly in delicate constitutions.

18. ii. TREATMENT OF THE ILL EFFECTS OF COLD. — *A. Means of prevention and counteraction. a.* Vascular and mental excitement, and physical and moral courage, are among the most powerful aids to the *resistance of cold*. To these should be added, when within reach, warm woollen or fur clothing; exercise; warm diluents, as tea, coffee, chocolate; gently stimulating cordials and tonics, and warm nutritious diet. All vinous and spirituous excitants are injurious when used against intense or prolonged cold, as they occasion internal fluxion and exhaustion. If resorted to at all, they should only be taken in small proportions, and in large quantities of hot diluents. This opinion is founded on repeated observation, and agrees with that advanced by Dr. CLENDINNING, who has paid much attention to this subject. According to the experience and practice of northern nations, and of those in warm countries who use either no clothing, or but little, the anointing of the cutaneous surface with oleaginous substances tends greatly to retard the refrigeration of the body.

19. *b.* When cold has *produced incipient ill effects* in the frame, indicated by horripilation, trembling, rigors, &c., a warm bed; hot diluents; stimulating diaphoretics, especially large doses of the spiritus æther. nitricus (from ʒj. to ʒiij. for a dose), either alone, or with the nitrate of potash and camphor; the repeated exhibition of ammonia, camphor, and opium — the last in small quantities; the warm or vapour bath, followed by friction of the surface; warm spices and cordials, are among the most certain means of restoration. It should be kept in recollection, that the sooner we succeed in counteracting the directly sedative effects of cold, the less violent will be the consequent reaction, and the less injury will ultimately result to the economy. As soon as reaction begins to appear, the treatment should be modified; and the means used to determine to the skin should be of a less stimulating kind; as the preparations of antimony and ipecacuanha; nitre, with camphor, and either of these substances; Dover's or James's powders, &c. &c. Whenever cold has caused shiverings or rigors, with pains in the head, back, and limbs, free reaction not having yet supervened, we may be satisfied that this state of system is associated with interrupted secretion and excretion; and that a quick restoration of these functions should be attempted. Therefore, if there be no symptom to forbid it, an emetic, followed by warm diluents, and the warm bath, and these by a cathartic medicine, should be prescribed, in order to restore a salutary reaction, and the suppressed secreting and excreting functions. In cases presenting the *extreme effects* of either very intense or prolonged cold, the means of restoration should be very gentle at first, and very gradually increased, as the chief danger to be feared proceeds from excessive reaction — excessive as respects the depressed state of vital power upon which it supervenes — and the rapidity with which inordinate action exhausts the remaining irritability and vitality of the frame. The means found most successful in restoring a frost-bit limb, viz. a very gradual increase of temperature and cautious admission of stimuli, are required in such circumstances.

20. *B. The injurious effects from cold fluids taken into the stomach*, when the body is perspiring and exhausted, require instant aid. These effects somewhat resemble those proceeding from an injury sustained upon the epigastric region; and consist of quick, laborious, or gasping respiration, remarkable weakness and irregularity of the pulse, great collapse and pallor of the countenance and surface, rapid loss of the animal heat, vertigo, with dimness of vision, loss of hearing, &c., and general torpor, followed by coma and death — the one rapidly succeeding the other. In such cases, warm diluents, with ammonia, camphor, and opium; cordial diaphoretics, frictions of the limbs and surface generally with stimulating embrocations; hot fomentations, sinapisms, and cataplasms of Cayenne pepper to the epigastrium, and especially animal warmth applied to the surface, particularly the anterior surface of the trunk, are the chief means of recovery. The remedy much employed in foreign countries in cases of external injury on the epigastrium is obviously appropriate in such cases, viz. the application to this region of one of the lower animals the instant that it is killed and opened, and before it is skinned, or has lost any of its warmth.

21. iii. OF THE REMEDIAL OPERATION OF COLD. —It does not come within the scope of this work to enter fully into the therapeutical application of cold; but I will very succinctly notice the subject

at this place. *A*. As respects the *effect* we wish to procure from it, cold is employed, 1st, in a slight degree, or for a short period, in order to produce its indirectly tonic influence; 2d, in a greater amount relatively to the state of the system, to procure its directly sedative operation, without inducing in any considerable degree its consecutive or indirect effect; and, 3d, to obtain its astringent or constrictive influence on circulating canals and vessels. *B*. As to the *mode* of using it in order to produce either of these effects, much importance ought to be attached. It may be directed, 1st, to a part or the whole of the *external surface*—*a*. by sponging with, or the employment of a douche, or the affusion of a continuous stream of, cold water locally, or using a cooling lotion; *b*. by affusing over all the body some cold or tepid fluid, or by sponging the surface generally with it; *c*. by immersion in a cold or tepid bath: 2d, to the *internal surfaces*—*a*. by respiring a cool or even cold air; *b*. by the ingestion of cold liquids; and, *c*. by the injection of cold or tepid fluids into excreting canals or passages.

22. It is obvious, from what has been advanced, that the *mode* of using cold will determine its therapeutic *effects*, not absolutely however, but only relatively to the state of the system at the time, and the nature and stage of the complaint in which it is prescribed. Thus, cold air, the cold affusion, shower bath, douche, and plunge bath, will produce either an astringent, or a tonic, or a sedative operation, according to the length of time either of them is employed without remission; a brief or momentary use of either, whether directed to a part only, or to the whole, of the surface, being followed by its indirect or tonic action; and a prolonged use, by a more or less permanent sedative effect. In the treatment of diseases of debility, or states of depression, we require the former operation, and, suiting the *mode* of applying the remedy to the nature of the affection, resort to it momentarily, and repeat it frequently. In maladies attended with excitement, interrupted secretion, &c., we desire the latter effect, and prolong the application till we are satisfied as to the extent to which we have obtained it. In congestion and hæmorrhages we wish to obtain the astringent or constrictive operation of cold, and therefore resort to it in a sudden or impulsive manner, as in affusion, douche, or aspersion; and as this particular effect of cold appears to be connected, and to commence, with its sedative action, and to terminate with, or to be overcome by, the consecutive reaction, according as it may supervene, so are we guided in determining the degree and duration of the cold to be employed, in order to astringe congested or bleeding parts. In the appropriation of each of the *modes* of using this remedy, by which very opposite effects are thus to be obtained, the practitioner is guided by considerations arising out of its operation upon the various systems and organs of the body, by its effects directly exerted on the seat of its application, and by its sympathetic action upon parts remote from thence, and upon internal viscera. It is, therefore, obvious that much advantage in practice will accrue from our entertaining correct ideas as to its action upon internal organs, when applied to a part or the whole of the external surface. I have already stated, that cold—whether cold air or cold water—constricts the whole cutaneous surface, and determines the flow of blood into the large trunks from the smaller canals and vessels (§ 5.); and that when directed for a short time, moderate reaction is usually brought about by this internal determination of the circulating fluid, and consequent excitation of the centres of nervous and circulating functions. This mode of operation must never be overlooked when employing cold as a remedy. The only question connected with it is, whether this constriction of the vessels near the external surface is limited to it, or extends sympathetically to internal parts. It is obvious, that, when the circulating fluid is propelled from one part, it must be determined to some other; but, whether does it accumulate in the large vessels, or retire both to them and to other surfaces? Pathological facts clearly show that the latter is most commonly the case. GIANNINI has, however, argued that the fluids are not driven upon the centre, but that constriction also takes place in internal viscera. That such an effect arises from the sudden and momentary shock produced by cold on the surface, and contributes to bring about the consecutive increased action, may be admitted, especially if it be employed locally, or in the vicinity of a congested or relaxed part; but when its action is of any considerable duration, or is directed to an extensive surface, the internal viscera must necessarily experience a proportionate increase of the circulating fluid. Thus, the brief affusion of a stream of cold water on the head, in cases of congestion of the encephalon, will tend to constrict the congested vessels, and remove the morbid condition, whilst a more general or prolonged application of cold will actually produce the very state, which this local use of it, in a sudden and momentary manner, is so efficient in removing.

23. In many cases, as in the excitement of fevers and acute inflammations, when the skin is hot and dry, we employ either local or general cold, with the simple view of abstracting a portion of the increased heat, which, owing to inordinate vascular action, and to the interruption of the perspiring and cooling function, becomes a morbid stimulus, and thus perpetuates the cause that originates it. It is obvious that cold, when judiciously employed in such cases, will even favour transpiration, and will lower excitement to that state which is compatible with a return of the secreting functions; but so much pathological knowledge and experienced discrimination are required to the advantageous or even safe employment of it, that no surprise can exist as to the disuse into which the practice has fallen. When the stage of excitement of continued and exanthematous fevers has been either imperfectly developed, or is about subsiding into collapse; when internal viscera are weakened and congested, and the skin is about regaining its interrupted function, the employment of cold in any way is attended by great risk, more especially when applied to the surface generally.

24. The good effects of cold applied to the head, in those diseases accompanied with an excited circulation in it, have induced various authors to recommend a similar practice in acute inflammations of the thoracic and abdominal viscera. There can be no doubt that the strictly local application of cold, as near as possible to

the organ affected, can be attended with no danger, particularly when the inflammation is acute, and chiefly attacks serous surfaces; and it may be in some instances productive of benefit; but we are still in want of faithfully observed facts to illustrate the effects of this treatment in a satisfactory manner. In hæmorrhagic affections, a judicious use of cold is often of great service — as the cold affusion or aspersion, the shower-bath, and cold sponging, in epistaxis and hæmoptysis; iced fluids taken into the stomach in hæmatemesis; enemata, and injections per vaginam, of cold liquids, in hæmorrhage from the bowels, menorrhagia, and flooding after delivery. Dr. Drake, of New York, has recently recommended very cold air to be respired in inflammations of the respiratory organs; but, from the admitted influence of cold air in increasing the activity of the respiratory functions, and, consequently, the phlogistic disposition of the circulation, it appears to me a practice of doubtful efficacy.

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COLIC. — Der. and Syn. from *κῶλον*, *Colon*. Κωλικὸν ἄλγημα, Gr. *Colica*, *Passio Colica*, *Dolor Colicus*, *Enteralgia*, *Colicodynia*, *Tormina*, Auct. Var. *Colique*, Fr. *Das Bauchgrimmen*, *die Kolik*, Germ. *Dolori Colici*, Ital. *Belly-Ach*, Eng.

Classif. 1. *Class*, Nervous Diseases; 3. *Order*, Spasmodic Affections (*Cullen*). 1. *Class*, Diseases of Digestion; 1. *Order*, Affecting the Alimentary Canal (*Good*). I. Class, I. Order (*Author*, in *Preface*).

1. Defin. *Severe griping pains in the bowels, with costiveness, and often with vomiting.*

2. Colic was formerly considered as seated chiefly, if not entirely, in the colon; but many writers of the last three centuries have applied the term to acute pains of the bowels, attended by costiveness, and unaccompanied by fever, arising either from a primary affection of them, or from disease of some other viscus in their immediate vicinity, with which they are connected, and often sympathetically affected, through the medium of the ganglial nerves.

3. The first mention made of the disease, by the denomination *Colicus Dolor*, is to be found in Celsus and Pliny; and, according to Sennert and Tronchin, the same name was used by Themison and Philon, physicians of the Augustine age, when, as Sprengel justly supposes, colic must, from the manners of that period, have been a common complaint. But, although the term colic appears not to have been in use, it cannot be supposed that such affections were before unknown. It is more probable that they were included under the general appellation of abdominal pains, in use from the time of Hippocrates. The greater number of modern writers have divided the disease into certain species or varieties, according to the presumed nature of its exciting causes and pathological states. Sauvages presents us, accordingly, with no less than 22 varieties. Dr. Cullen arranges the *idiopathic* states of the colic into, 1st, The *Spasmodic*, either with stercoraceous vomiting, or with inflammation superadded; 2d, The *Colic of Poitou*; 3d, Colic from continued constipation; 4th, From acrid matters in the bowels; 5th, From retention of the meconium; 6th, From stricture of the bowels; and, 7th, From the obstruction occasioned by calculous formations. Dr. Good adopts a nearly similar division to the foregoing, preserving the 1st, 2d, 3d, and 6th varieties; and substituting for the others, Colic from Surfeit, and Colic from the generation of Flatulence — C. *Cibaria* and C. *Flatulenta*. M. Pariset gives the following varieties: — the flatulent; the stercoraceous; the bilious; the inflammatory; the hæmorrhoidal; the menstrual; the spasmodic; the metastatic; from calculous and other hard bodies; the verminous; from organic changes in the bowels; and from lead. M. Chomel divides the disease into nearly the same varieties, and adds to them that arising from acerb or acid fruits, and fermented liquors, or *Colique Végétale*. The only additional arrangement of the forms of colic, which deserves being noticed, has been given by Schmidtmann, as follows: — *A*. Inflammatory colic; *B*. Sanguineous or plethoric colic; *C*. From substances passing through or lodged in the bowels; *D*. From the metastasis or repression of other diseases; *E*. Flatulent colic; and *F*. Nervous colic. Each of these comprises several varieties, according to the exciting and proximate causes.

4. Colic, according to the extended acceptation of the word, arises from so many causes, and presents so many morbid relations, that a satisfactory arrangement of its different states is by no means an easy matter. I shall, however, attempt to group into distinct species those forms of the disease which resemble each other most nearly, or which arise from intimately related causes, noticing the peculiarities or modifications presented by the principal varieties. Those forms of colic which chiefly, or more immediately, depend upon a morbid state of the

intestinal canal will come *first* under consideration; and *next*, those which are symptomatic of, or complicated with, other diseases. In treating of the former, those states which are the most simple, and apparently consist of functional disturbance of the bowels, will be first noticed, and subsequently those which proceed from more complicated or organic causes. As I agree with Burseri, Cullen, Good, Abercrombie, Monro, and others, that *ileus* is often either an aggravated state, or advanced stage, of colic, or a consequence of organic or other causes affecting the calibre or canal of some part of the small or large intestines, I shall treat of it at this place, and after the more simple or less dangerous forms of colic have been discussed.

5. I. Colic chiefly and primarily from functional Disorders of the Bowels.

i. *Simple Colic.* Syn. *Colica Convulsiva*, Bonet; *C. Spasmodica*, Hoffmann; *C. Flatulenta*, Good, &c.; *C. Nerveuse*, Chomel; *C. Nervosa, et C. Spasmodica*, Schmidtmann. Classif. I. Class, I. Order (*Author*).

Defin. *Acute pain in the bowels, with occasional partial remissions, flatulent distension, or spasmodic contractions, or both, at the same time, relieved by pressure and the expulsion of flatus.*

6. There appear to be three morbid conditions of the intestinal canal, which more or less exist in the simplest as well as in the most severe and complicated forms of colic, and which evidently depend upon depressed vital power of the digestive canal: 1st, Morbidly increased sensibility and irritability of some part or the whole of the bowels; 2d, Irregular distension and spasmodic constriction of different parts of their canal; and, 3d, More or less copious generation of flatus in their tract, occasioning great distension and irregular reaction of the muscular tunics — the second morbid condition adduced. According as either of these states predominates above the others, the attack assumes a *nervous*, a *spasmodic*, or a *flatulent* character; and it has thus acquired these specific appellations from different authors.

7. *A.* The *nervous* form of the complaint occurs most commonly in females, and in persons of a nervous and irritable temperament, passing a sedentary or indolent life, and of a costive habit of body; sometimes without any evident cause, but often after inattention to the state of the bowels, exposure to cold, or some mental emotion or excitement. The attack is usually sudden, and the pain is felt in one or more places in the abdomen, but shifts its place frequently, and is exacerbated at irregular intervals. The face is pale and anxious; the abdomen is irregularly contracted, and pressure of it often affords slight relief. During the severity of the pains, a cold perspiration is forced out on the surface, and leipothymia, or sinking, is frequently complained of. The bowels are constipated, and borborygmi are constant. The duration of the attack is usually short — from one to several hours; and it generally terminates favourably; but repeated returns of the affection are very common, upon errors of diet, and from mental inquietude.

8. *B.* The more *flatulent* form of colic presents greater distension of the abdomen, the expulsion of flatus giving ease. The distension and pain are often traced along the course of the colon, and are most complained of in the situation of the sigmoid flexure and cæcum. The quantity of flatus generated is often very great, and it evidently proceeds chiefly from irritation of the mucous surface of the bowels, giving rise to the separation of a gaseous fluid from the blood by the vessels of this surface; the matters retained in the prima via being insufficient to furnish, by their decomposition, — granting that they undergo this change, — so great a quantity of flatus as is generally voided. Owing to the irritation produced by the flatus, the bowels are inordinately distended in one part, and irregularly constricted in another; the part which was contracted, losing its tone, and becoming, after a time, greatly distended, and the distended portion experiencing, at intervals, irregular spasmodic constrictions. Thus the retained flatus is propelled from one part to the other, occasioning griping, shifting pains, and rumbling noises, or borborygmi, of the abdomen. The bowels are always constipated; and when evacuations are procured, they chiefly consist of hard lumps, and are accompanied with the escape of much flatus; the secreting functions of the bowels being evidently impeded. This modification of the complaint, as well as the preceding, is frequent in hysterical females, and persons of indolent habits, living much on vegetable diet, whose intestinal and biliary secretions are scanty, acrid, or otherwise vitiated; and their digestive functions weakened by indulgences.

9. *C.* The more *spasmodic* form of colic is in many cases merely a somewhat aggravated state of the preceding; the extremely painful spasmodic constriction predominating above the flatulent distension, and extending more or less to the abdominal muscles, giving rise to severe and irregular contractions, often with retraction, of the abdominal parietes. Whilst the two preceding varieties are very seldom attended by sickness or vomiting, unless in the severest states, this variety is frequently accompanied with this symptom; and, in its worst forms, vomiting, upon taking substances into the stomach, is very general. Constipation is also very obstinate; injudicious attempts at relieving it often increasing the vomiting, and converting simple colic into either enteritis or simple ileus. This form of colic often attacks those of spare habits of body, of the hypochondriacal and bilious temperaments, who live chiefly on coarse vegetable food, and are addicted to fermented or spirituous liquors.

10. ii. *Colic from the injurious Nature or Quantity of the Ingesta.* — *C. Accidentalis*, Willis and Cullen; *C. Végétale*, Chomel; *C. Cibaria*, Good.

Defin. *Severe twisting, griping pains in the abdomen, with vomiting, and rigid contractions of the abdominal parietes, followed, in some cases, by griping alvine evacuations, and looseness.*

11. *A.* This species of colic presents various modifications, according to the nature of the offending cause; and it has been accordingly differently described and named. Its states vary greatly in severity, according to the nature of the ingesta occasioning it, whether those of a solid or fluid kind. It may be here remarked, that the colic of Poitou, or *colica Pictonum* (which name has been very generally confounded with *colica pictorum*, or painters' colic), and the form of the

disease endemic in some other countries, although in many respects the same as lead or painters' colic, are evidently partly occasioned by the crude wines, new spirits, and the acerb and acid nature of the liquors in common use, as well as by lead, which is sometimes dissolved in them. (See *Lead Colic*, § 26.) Citesius, Piso, Cardan, Sennert, Wepfer, and many recent authors, have imputed the endemic of *Poitou*, *Madrid*, and other places, entirely to the nature of the ingesta, into many of which mineral substances could in no way enter. The evidence furnished by their writings, and in the treatises of Grashuis and Tronchin, and my own experience, favour the opinion that acid and acerb liquors are often concerned in the production of colic, without the aid of lead; to which, however, the most severe cases, and those accompanied with paralysis, are attributable, as shown by Sir G. Baker. Dr. Bateman doubts the power of these ingesta, independently of their impregnation with lead, to produce the disease. His opinion is, nevertheless, opposed by the fact, that a large proportion of the cases of colic which occur in districts where acid and spirituous liquors are much used, is not attended by the paralytic and other symptoms characteristic of lead colic, and that many of them run on to dysentery. Whether or not the colic stated by Kæmpfer to prevail in Japan, owing to the use of fermented beverages prepared from rice, depended on the presence of lead, cannot be ascertained. I had means of knowing that the colic so prevalent among the natives of Africa is clearly owing to the excessive use, particularly when over-heated, fatigued, or covered by perspiration, of the acid beverages prepared from the juice of the palm and other trees, and in the making of which no sort of metal utensil, or of glazed pottery, is at all employed. Linnæus imputes the prevalence of the complaint among the Laplanders to the use of stagnant water, containing small worms, &c. In various parts of the north of Europe, where butter-milk whey, and vegetable infusions, are fermented into very acid liquors, and used for common drink, most severe attacks of colic follow their ingestion in a cold state, particularly when the body is perspiring. Dr. Chisholm attributed the prevalence of colic in Devonshire to the abuse of cider in summer and autumn, by the labourers, when busily engaged in the hay and corn harvest — the cold acerb cider inducing a spasmodic state of the bowels in persons overheated by laborious exertion.

12. *B.* Various articles of food will occasionally disagree from some peculiar idiosyncracy, the articles themselves not being injurious. Such is sometimes the case, when a person, who has been living sparingly, indulges in a too full meal, or partakes of a substance to which the stomach, the functions of which are perhaps weak, is unaccustomed. Pork, cooked very soon after being killed, particularly if used as an article of diet in warm climates, is very apt to produce attacks of colic, followed by griping evacuations from the bowels. A similar effect often is induced by blown or tainted meat, mildewed wheat or rye, and by cold, acerb, indigestible, or unwholesome fruits, as cucumber, melon, &c. The injudicious use of cold griping purgatives, as senna, &c., will often, if not properly combined with other medicines, occasion this state of colic in hypochondrial, bilious, or phlegmatic habits.

13. Most severe effects often follow the ingestion of poisonous fish, muscles, lobsters, mushrooms, &c., and of the minute fungi sometimes formed on smoked meat and sausages, or on cheese. But the colic which is produced in these cases is the least dangerous part of the mischief; the affection of the nervous and vascular systems being often of still greater importance. Instead, therefore, of considering the effects of these substances as varieties of colic, as Dr. Good has done, I have viewed the disorder of the stomach and bowels as a part only of the circle of morbid actions they occasion, and have therefore treated of them in the article Poisons.

14. The presence of *arsenic* in wines, or the fumes of this metal; preparations of *antimony*, *copper*, or *zinc*; and the accidental solution of these, or conversion of them into a salt by substances about to be received into the stomach; are often productive of disorder, of which colic is one of the most prominent features, generally attended by vomiting, and sometimes followed by looseness, or by tenesmus and dysenteric symptoms. Lead colic is very often occasioned by the ingestion of the metal in some state or other by the mouth, and should therefore be treated of at this place, but the peculiarities of this variety require for it a separate consideration. Many substances occasion, when taken in hurtful quantities, effects of which colic is among the most prominent; but which, as they present certain diversities, are described in a separate article. (See Poisons.)

15. *C. Infants*, especially from birth to the termination of teething, and occasionally older children, are very liable to this form of colic. The state of the mother's milk, arising from the want of health, or manner of living, the irritation connected with dentition, too early feeding, too much or inappropriate food, acidity of the *primæ viæ* resulting therefrom, and want of attention to the bowels, are the most common causes of this complaint among infants. In children it is often produced by acerb or unripe fruit, and by cold. In very young subjects it is characterised by more or less flatulence, screaming, tossing of the arms, and forcible drawing up of the lower extremities upon the abdomen, with vomiting, costive bowels, and greenish, offensive, and acid evacuations; followed by looseness; or free evacuations attended by tormina.

16. iii. *Colic from a morbid State of the Secretions poured into the Bowels, and Retention of the Excretions.* — *Colica Atrabiliaris*, Meyserey; *C. Biliosa*, Hoffmann; *C. Stercorea*, Ettmuller, Sauvages, and Cullen; *C. Pituitosa*, Sennert, Fernel, &c.; *C. Stercorale, et C. Bilieuse*, Pariset; *C. Constipata*, Good; *C. Biliosa, et C. Stercoracea*, Schmidtmann; *Hepatic Ileus*, Musgrave; *Colica Madridensis, et C. Hispaniensis*, Auct. Var. *Dry Belly-Ache.*

Defin. *Severe griping pain, with porraceous or bilious vomitings, constipation, or scanty evacuations, and often with hiccup, tension of the abdomen, and restlessness, the motions procured presenting various morbid appearances.*

17. This species of colic has been differently described, and named as above, according to the views entertained respecting its nature. We

have seen that the *first* variety of the disease consists of various morbid states, chiefly characterised by deficient function and altered sensibility of the bowels, &c.; and that the *second* variety is principally occasioned by the nature and quantity of the ingesta. The variety which I next have to consider comprises certain forms of disorder arising mainly from the morbid condition of the secretions and fæcal matters contained in the bowels, but aided by other causes; and it may be divided into, *a*. The colic of infants, caused by retained meconium; *b*. Colic arising from accumulated fæcal matters in the bowels; and, *c*. From the irritation of morbid secretions poured into the intestines from the liver, &c.

18. *A*. The colic which is owing to the retention of the meconium (*C. Meconialis*, Sauvages and Good,) in new-born infants, is chiefly met with in those who have either not been sufficiently early put to the mother's breast; or who have been suckled by a nurse, or brought up by hand. The milk which is first secreted, possesses purgative qualities, intended by Nature to promote the expulsion of the secretions, which had accumulated in the prima via during the latter period of fœtal life; and when the infant enjoys not this requisite kind both of nourishment and medicine, the meconium is retained, becomes viscid, acid, and irritating to the bowels, occasioning costiveness, distension, screaming, drawing up of the lower extremities, sickness, &c.

19. *B*. It is evident that the retention in the cæcum and cells of the colon, of those excrementitious matters which require to be thrown off from the bowels, will be productive of more or less disorder. Such retention usually occurs very early, and in advanced life; in those who pass an indolent existence, or are engaged in sedentary occupations; in persons whose bowels are torpid from debility or exhausted sensibility; in females who are pregnant, or who are of an advanced age; and in men who have old herniæ. It is often preceded by indigestion, cardialgia, constipation of the bowels, and fulness about the cæcum, the sigmoid flexure, and occasionally the whole course of the colon. In many cases, large accumulations in the Cæcum or Colon (see these articles), may be detected by manual examination. Sickness and vomiting, however, seldom come on until abdominal griping pain has been for some time complained of, and the stomach has been irritated by acrid purgatives. Later in the complaint, the abdomen becomes tense, tumid, and painful on pressure; the pulse accelerated; and the tongue, which was from the commencement loaded at the root, more foul or furred. This form of the disease is very apt to terminate in dysentery, enteritis, or ileus.

20. *C*. The form of colic which occurs, and even prevails, in some of the West India islands, has often been confounded with lead colic, from the supposition that the new rum drunk in these islands contains lead in solution. Mr. Quier, Dr. Chisholm, and Dr. Thomson, who resided long in the West Indies, state that this disease is not so common as formerly in these islands, owing to the improvement in morals, and the use of warmer clothing; and that nothing is more erroneous than attributing it to the poison of lead. These physicians refer it to the intemperate use of spirits, and to alternations of heat and cold. Mr. Quier and Dr. Musgrave, who have given a very detailed account of this complaint, as they observed it in Jamaica and Antigua, where it is of frequent occurrence, state positively that lead is not concerned in its production. From the history they have given of this endemic colic of the West Indies; and from the descriptions of the colic, which is perhaps the most common disease in Madrid and several provinces of Spain, furnished by MM. Pascal and Marquand, who treated many hundred cases of it in the French army that occupied Spain during the peninsular war, and in 1824 — all which accounts are now before me; I conclude that the colic of Spain and that of the West Indies depend upon the same causes — evidently of an endemic kind; are characterised by similar symptoms; run the same course, evince similar lesions, and are cured by the same treatment. Indeed, I have seldom met descriptions of any disease so much alike as those furnished by Dr. Musgrave and by M. Marquand, who himself had the complaint, the causes and treatment of which he has so ably investigated. After examining the causes to which writers, particularly Hoffmann and Thiery, and others copying them, have imputed this affection, viz. to lead and metallic substances dissolved by acid wines, &c., M. Marquand states those to which the natives attribute it; namely, the use of vegetable acids and unripe indigestible fruits; large draughts of wine and water, and of much milk; and insufficient clothing on the trunk of the body and abdominal regions. But these causes, he remarks, are in operation in many places of Spain and Portugal where colic is rare, and therefore some endemic cause not yet discovered must be in operation. M. Larrey imputes it to atmospheric vicissitudes and acid beverages, and designates it "*Colique bilieuse rheumatismale*," MM. Aulagnier, Libron, and Jacob, who have had extensive experience of this disease in Spain, concur with M. Marquand in denying the influence of lead in producing it; and think that its causes are not yet fully ascertained. The negative information furnished by these writers, the character of the symptoms, and particularly the appearance of the evacuations, would lead me to infer that, in both the colic of Spain and the colic of the West Indies, endemic causes, — especially those which proceed from the soil, and produce intermittent and remittent fevers, — impede the functions of the liver and intestinal surface, and occasion an accumulation in the hepatic ducts, gall-bladder, and prima via, of acrid or otherwise morbid secretions, which, owing to their irritation, or to concurrent or determining causes, give rise to a series of painful and diseased actions, and imperfect or abortive attempts at their evacuation. The symptoms referrible to the liver — its congestion — the signs of irritation about the duodenum, the vitiated dark appearance of the stools, and the relief obtained from free alvine evacuations, are proofs of this position.

21. *Symptoms.* — The patient generally experiences premonitory symptoms before the accession of the attack. These consist of dull and pressing pains in the whole course of the colon, but particularly in its arch; loss of appetite; irritability of temper; and difficulty in evacuating the bowels, which, however, *are not costive.* The patient has often several evacuations in the course of the

day, but in small quantity, and with much flatus; and he experiences less distress in bed than when he is up. The tongue is moist, and loaded only at the root; and there is much thirst. These symptoms usually continue two or three days: about the third, the patient has no longer any desire to go to stool, and evacuates no more flatus; but the pain becomes more severe, and more fixed and constant at the epigastrium, with a twisting pain at the umbilicus: the countenance is pale, and expressive of pain and anxiety; the pulse is slow, small, regular, and constricted, but not febrile; the skin is dry, but not hot; and the urine is scanty, but not otherwise unnatural. The patient often sits with his arms crossed over, and pressed upon, the abdomen, and the trunk bent forwards. If he be in bed, the thighs are pressed up upon the belly. Along with these symptoms, and generally soon after the accession of constipation, porraceous or bilious vomitings come on, commonly in small quantities, mixed with glairy matters, or those last taken into the stomach, and accompanied with hiccup. There is no sleep, but a continued restlessness: the pain is now nearly constant, and most severe, particularly about the epigastrium and umbilicus, and is not ameliorated by any position. As the malady proceeds, the thirst increases; and the fluids taken generally aggravate the hiccup, and are soon thrown off. The eyes are sometimes slightly yellow, and the whole surface rather sallow. The patient is distressed by the continued severity of the pain, the hiccup, and the want of sleep; wandering and delirium comes on, sometimes with deafness, epileptic convulsions, and rarely with fæculent vomiting; these latter symptoms generally portending a fatal result.

22. This disease, left to itself, usually runs its course in eight or ten days, and rarely extends beyond the fifteenth. Pain or uneasiness in the right hyponchondrium is often felt some time before the attack, and occasionally not until the advanced progress of it. In some cases, the pain and vomiting cease, upon the free spontaneous excretion of flatus, with dark, hard motions: but occasionally they return after a short time, and black atrabilious matter is thrown off the stomach. The discharge from the bowels is generally very morbid, offensive, and of a dark, blackish, or deep green colour. In other cases, where the patient has been neglected or improperly treated, chronic debility, with marasmus, and, more rarely, paralysis, supervenes, and usually terminates fatally. The abdomen is seldom much retracted, excepting about the umbilicus; but, at the last or fatal stage of the disease, it is much distended. The bowels usually resist the action of the most powerful purgatives at its advanced period, and injections are thrown up or retained with difficulty.

23. *Prognosis.* — *a.* A *favourable* issue is indicated by free evacuations, followed by amelioration of the abdominal pain and vomiting, by the circumstance of the pulse remaining below 100 beats in the minute, and the non-supervention or subsidence of hiccup. *b.* An *unfavourable* result is preceded by more or less tenderness, tension, and tumefaction of the abdomen; by a pulse above 100; by obstinate constipation, and immediate return of the injections; by the severity and continuance of singultus; by dryness of the tongue, and increased restlessness and tossing.

24. *Dissection* has thrown little light on the nature of the disease. M. Marquand, whose experience was extensive, considers that whatever change of structure is observed, is merely a contingent circumstance, or accidental complication. M. Pascal states, as the result of the examinations he made of six fatal cases, that little or no lesion was observed in any part of the alimentary canal, excepting slight redness of the mucous surface of the duodenum: the gall-bladder was loaded with thick bile; but the other viscera were natural. He further states, that he found the sympathetic ganglia injected. A perusal, however, of his description of the appearances presented by them, impresses me with the belief that what he considered to be unusual vascularity, was not more than they always present in the healthy state.

25. iv. *Colic from the Poison of Lead.* — Syn. *Colica Saturnina, C. Pictorum, C. Pictonum,* Auct. Var. *C. Rhachialgia (ῥαχιάλγια, Spine-Ach),* Astruc, Good; *C. du Poitou, C. de Plomb, C. Metallique, Rachialgie Metallique,* Auct. Gall. *Bleicolik, Trocken Colick,* Germ. *Devonshire Colic, Painters' Colic, Lead Colic, &c.*

Defin. *Dull remitting pain, becoming constant and violent, extending to the back and upper and lower extremities; vomiting, obstinate constipation, often followed by paralysis.*

26. I have already noticed the fact of this disease being often confounded both with the form of colic produced by acid and acerb ingesta (§ 11.), and with that depending upon a morbid state of the secretions poured into the intestinal canal (§ 20.). Lead colic chiefly attacks house-painters and plumbers, workers in the different preparations of lead, glaziers of earthenware, miners, ornamental and water-painters, gilders, and rarely chemists and printers. It is very probable that the colic so prevalent in Devonshire, Poitou, and, according to Tronchin and Wanstroostwyck, in Haarlem and Amsterdam, arises in some instances from a portion of lead contained in acid beverages, and possibly from the water used for domestic purposes; but that the endemic colic of the West Indies and Spain is occasioned by lead, as many suppose, has been disproved, as we have seen, by the more accurate observations of modern enquirers, especially directed to this point. Lead colic arises not only from the introduction of the mineral into the system along with the ingesta, but also from its oxides being allowed to remain in contact with the surface of the body; as in the case of workers in lead, as shown by Lentin, Brambilla, Sir G. Baker, and Dr. Reynolds; and from the volatilised fumes of lead floating in the air, in recently painted apartments, as observed by Percival, Henckel, Gardanne, Badeley, and Good. It is extremely probable that lead produces a more injurious action upon some constitutions than upon others; and that its oxides and sub-salts are more injurious than its super-acetate. The most quickly, and sometimes the most powerfully, injurious operation of lead is when its oxide is mixed principally with turpentine, for the purposes of house-

painting. This spirit carries along with it, during its volatilisation, a portion of the oxide, and thus poisons the respired air, thereby affecting the respiratory nerves and even the blood itself. Soon after Sir G. **Baker**'s investigation of the effects of lead, and of the substances which either contained, or might by possibility contain it, was made public, every thing which came in contact with lead in any form was viewed with suspicion. Dr. **Percival** first demonstrated the folly of these apprehensions; and although the water which supplies a million and a half of persons in this metropolis passes through leaden pipes, and is long retained in leaden cisterns, which are often allowed to become foul, yet, I believe, that no case of lead colic occurs from this cause, excepting in those who are affected by lead in a different and manifest manner. Dr. **Bateman** never met with a case in London which could not be traced to this source; and I certainly never did, notwithstanding the readiness with which the effects of lead are produced in some persons. Although lead is thus the efficient cause of the complaint, it is not always the only cause. Thus, the acid beverages or spirits in which the food is taken may determine its effects; or an attack may be induced, in a person imbued with the lead poison, by improper ingesta, spirituous liquors, exposure to cold, and by sulphureous waters, or sulphureted medicines, and cold griping purgatives. Cases have been recorded by Dr. **Wall** and Sir G. **Baker**, where the external medical use of the preparations of lead occasioned the disease, but such are of rare occurrence.

27. *Symptoms.* — Lead colic usually commences with obscure pain of the abdomen, which becomes, at first, at intervals, so severe, that the patient screams, tosses himself about, and vainly seeks a posture that will lessen his sufferings. Some lie for a while on the abdomen, and others press upon or rub this part with the hand. The pain is generally greatest at the pit of the stomach, and as the disease proceeds, extends to the back, upwards to the arms, and downwards to the loins, thighs, and legs. A twisting pain is also generally felt about the navel, which is at first drawn inwards; and cutting pains shoot at times with great violence to both hypochondria and iliac fossæ, and through the abdominal muscles. The voluntary muscles often become so sore that they cannot bear the slightest pressure; and the pain frequently alternates between the stomach and bowels and the external muscles. Sickness and constipation are early symptoms, — the matter thrown off the stomach consisting of a slimy fluid, either with or without acrid deranged bile, which is continually being secreted, accumulates, irritates, and is evacuated. To these are generally added bitter eructations, hiccup, severe headach, pains of the wrists, hands, ancles, soles of the feet, &c.; and frequently of the shoulders and neck. These symptoms are aggravated during the night, depriving the patient of a moment's repose. The pulse is not, at first, affected — sometimes in no measure throughout the disease; in many cases it is below the usual standard, and in others quicker and weaker, more rarely fuller or stronger. The tongue is pale, moist, and soft, without erection of the papillæ. The skin is commonly soft and moist; it is rarely hot. The urine is various, but more frequently copious than otherwise. Costiveness continues as the disease advances; sometimes a griping disposition to stool occurs; and if any fæces are passed, they are scybalous, hard, resemble sheep's dung, and are mixed with a dirty watery fluid containing a dark slime, and occasionally a little blood. M. **Merat** analysed the matters evacuated, but could not detect any lead in them. The abdomen is insensible to pressure; in some instances rigid and knotted; but in the latter stage often distended and slightly painful, chiefly from the distension of the bowels, and affection of the muscles. In the cases which have occurred in my practice, distension of the abdomen was as frequent as retraction, owing evidently to inflation and fæcal engorgement of the colon, the course of which could be distinctly traced under the abdominal parietes. M. **Andral** has also met with a similar state of this cavity. In some cases I have remarked considerable retraction around the umbilicus, while all the rest of the abdomen in the course of the colon was greatly distended. Dr. **Munro** states that the sphincters of the bladder and rectum are sometimes so contracted that the urine and fæces cannot be voided. I have observed this chiefly as respects the sphincter ani — a clyster pipe being with difficulty introduced. If the complaint be not soon ameliorated, the pains of the back, loins, and limbs become more violent, and are attended by extreme weakness, tremulousness, and even partial or complete paralysis, particularly of the extensor muscles. In some cases, dyspnœa, palpitations, and a short dry cough, are complained of, seemingly owing to the pressure of the inflated colon upon the diaphragm; and occasionally epilepsy, coma, or even apoplexy, supervenes.

28. *Duration, Complications, and Prognosis.* — *A.* The *duration* of the attack varies from two or three to twenty-five days. M. **Ranque** found that, out of 147 cases, 129 recovered between the second and the thirteenth day of treatment, and the remainder before the twenty-sixth day. But relapses, or rather returns, of the complaint are most common. I have met with instances of a ninth and tenth attack; and more numerous seizures have occurred in the practice of others. In more unfavourable cases, the disease continues for weeks, or even months, with occasional intermissions; but such may be viewed as a succession of attacks, and occur chiefly in drunken workers in lead — addiction to spirits aggravating and reproducing the effects of lead on the system.

29. *B.* This disease is sometimes *complicated* with epilepsy; more frequently with palsy, in which it often terminates; and rarely with inflammation of some one of the abdominal viscera, and with mania or delirium.

30. *C.* The *prognosis* is *favourable* when the symptoms are mild, or are ameliorated by treatment; but it should be given with caution and reservation when the attack is very severe, is attended by hiccup, by obstinate and continued vomiting, by tremulousness, and by distension of the abdomen. It should be *unfavourable*, if complications (§ 29.) appear in its course; or if deafness, blindness, fæcal vomiting, and symptoms of ileus, supervene.

31. *Appearances observed on dissection.* — Lead colic is most commonly fatal from the complications that occur in its course. In its

simple state it seldom terminates in death. The examinations made by Senac, Astruc, and Bordieu, furnish nothing satisfactory. Stoll observed the gall-bladder loaded with dark bile: Sir G. Baker describes the bowels as being perfectly natural throughout, and the muscles pale and wasted. De Haen states, that he found contractions of the colon and cæcum in all the cases he opened. M. Merat examined seven cases, which he says presented the same appearances as those described by De Haen; whilst M. Andral details six cases, in all of which no such contractions were observed, nor any other morbid change of the alimentary canal. M. Louis, also, found no alteration in the bowels. Most of those who die of this disease are carried off in epileptic convulsions, or have had paralytic symptoms. The state of the cerebro-spinal axis is hence deserving of examination. M. Andral, however, states, that he detected no lesion of the brain, nor of the spinal chord, nor of the voluntary nerves. A case I had an opportunity of examining confirms the observations of Sir G. Baker and Andral.*

32. II. Colic arising most frequently from Change of Structure or relative Position of the Bowels. — Classif. IV. Class, I. Order (*Author*).

i. *Colic from Mechanical Obstruction of the Canal of the Bowel.* — Syn. *C. Calculosa et C. Scirrhosa*, Bonet, Chomel, Lamotte; *C. Constricta*, Good.

Defin. *Costive, flatulent state of the bowels, attended by passing colicky pains, relieved by liquid, difficult motions, and often accompanied by a sensation of constriction; tumour or difficulty in a particular part of the abdomen.*

33. Considerable mechanical difficulty is often experienced for some time before a severe attack of colic or ileus takes place. A patient, whom I have long attended for slight colic pains, and irregular state of the bowels, without full or satisfactory evacuations, states, that a sensation of soreness in the situation of the arch, and of difficult passage to the left flexure of the colon, with painful distension about the cæcum and right side, are often felt shortly before an evacuation. Dr. Monro remarks that stricture of the bowels in its early stage occasions costiveness, alternating with diarrhœa and colic pains. If the obstruction be low in the bowels, solid fæces are either not passed, or they are of small quantity and slender calibre. These strictures are most commonly met with in the colon; and their situation, in some cases, may be inferred from tho sensations of the patient, and the symptoms observed in examining the abdomen: they are fully described in the article on *Morbid Structures of the* Digestive Canal. (See also arts. Cæcum, and Intestines.) When colic is owing to the presence of concretions, stones of fruit, &c. in the bowels, distinct hardness, or even tumour, is sometimes felt; but, in many instances, no such change can be detected, although the patient generally refers to some part of the abdomen as presenting a fixed pain, or obstacle to the functions of the intestines. (See art. Concretions — *Intestinal.*) In all cases of colic pains arising from the above pathological states, great distension and tenderness of the abdomen often speedily come on, partly owing to inordinate dilatation of that portion of the canal above the obstruction. Sickness also at stomach, and vomitings, generally precede or follow these symptoms, with restlessness and distress; and the complaint soon assumes all the characters of ileus, unless the retained matters pass the obstacle, or the obstructing body itself be propelled downwards and evacuated, as is often the case in respect of biliary and other concretions. When colic proceeds from incipient mechanical obstacles in the intestinal canal, the symptoms are less violent; but they are of frequent recurrence, until the obstruction is removed, or they increase so as to produce inflammation of the bowels or ileus.

34. ii. *Colic, with complete Obstruction of the Bowels, and Stercoraceous Vomiting, Ileus, Volvulus* — Syn. Εἰλέος (from εἰλέω, I constringe), Hipp. Εἵλεον (from εἱλέω, volvo, I roll about — hence, volvulus), Aretæus. Χωροδαψος (from χορδὴ, a chord, and ἅπτω, I kill), Galen. *Morbus tenui Intestini*, Celsus. *Acutum Tormentum*, Cœl. Aurel. *Iliaca Passio, Iliacus Morbus, Chordapsus, Miserere, Dolor Ileus Spasmodicus*, Auct. Var. *Volvulus*, Baillou. *Ileus Verus*, Sydenham. *Ileus Spasmodicus*, Sauvages. *Colica Ileus*, Good. *Passion Iliaque*, Fr. *Darmgicht*, Germ. *Volvolo-passione Iliaca*, Ital. *Iliac Passion*, Eng.

Defin. *Violent griping pain, obstinate constipation, with retraction of the navel, and spasms of the abdominal muscles, tension, tenderness and distension of the abdomen ultimately supervening, and generally with stercoraceous vomitings.*

35. Galen, and after him, Van Swieten, viewed ileus as merely a form of inflammation of the bowels. Others, particularly Sauvages, Barthez, Cullen, Pinel, and Alibert, ascribed to it chiefly a nervous or spasmodic character. Many writers of the last century have divided it into idiopathic and symptomatic; whilst M. Raige Delorme, and others, have disputed its idiopathic nature, and particularly its nervous origin, and have considered it, as it, doubtless, most frequently is, a consequence of mechanical obstruction, inflammation, or some pre-existing disease. There can, however, be no doubt, although many of the cases observed may have been merely severe instances of colic, in which the proper symptoms of ileus had not come on, that it sometimes occurs as a simple

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* Mr. Byam and myself recently examined the body of a painter, who died at the age of 78. He had been a very strong man, and in constant employment all his life up to a few days before his death. He died of hæmatemesis, from disease of a branch of the coronary artery of the stomach. The substance of the heart was soft and flabby. The small and large intestines were sound; the liver was studded with collections of a pultaceous semifluid matter, of a greyish white colour, contained in very thin cysts, from the size of a hazel nut to a walnut, the portions of liver surrounding them being softened and of a dark red colour. The top of the anterior mediastinum, and space behind the top of the sternum, contained an immense mass, nearly the size of the closed hand, of enlarged glands, of a cheesy consistence and appearance; and a similar change of the absorbent glands existed behind the arch of the aorta, the superior cava, &c., extending in the form of a long cushion down the vertebræ into the abdomen. The small arch of the stomach, the pylorus, and commencement of the duodenum, were remarkably thickened, from the deposition of adventitious matter, the thickened mass nearly approaching the characters of scirrhus. The coats of the arteries of the stomach were diseased, and contained atheromatous matter.

and idiopathic disease, as Barthez, Maxwell, and Dr. Abercrombie have demonstrated; and that dissections of fatal cases sometimes present no morbid change sufficient to explain the symptoms or to account for the result. In the cases recorded by Barthez and Maxwell fæculent vomiting, and the discharge by the mouth of matter thrown into the colon, are described to have occurred, and yet recovery took place. In many instances, perhaps the majority, ileus supervenes on one or other of the forms of colic already described; or, in other words, certain pathological states commence with symptoms, which, in the *tout ensemble*, constitute some one of the forms of colic described, and terminate in fully developed ileus. Such terminations are most common in the second, third, and fourth varieties of colic. But in rare instances, ileus comes on suddenly, with the most violent abdominal pain and vomiting, the patient tossing about in the utmost agony, the other symptoms of the disease rapidly appearing, and most frequently terminating fatally.*

36. *History.* — Ileus is either preceded by constipation and colicky pains, or it is a more intense form of colic from the commencement, the symptoms differing only in degree. Early in the disease, constipation; twisting and violent pain about the umbilicus, sometimes not aggravated by, but even alleviated by pressure; constant retchings; absence of fever, and a pulse not exceeding, or even below, the natural standard, are the usual signs. If relief be not soon procured, the abdomen enlarges, and becomes tense, tender, and tympanitic; the countenance is anxious and collapsed; fæculent matters are ejected by the mouth; the pulse becomes frequent, small, and constricted, the thirst urgent; and violent tormina, with ineffectual attempts at evacuation of the bowels, hiccup, failure of the mental energies and vital powers, with cold, clammy, and partial sweats, cold extremities, cold, sunk features, leipothymia, and sinkings, supervene. In many cases, inflammatory symptoms appear early in the course of the malady, and pass rapidly into those indicating the commencement of grangrene. The state of the tongue is different in different cases, and stages of the complaint. It is occasionally not materially changed. Often the disease is referrible at its commencement to no particular region of the abdomen; but as frequently the patient refers his sufferings to a particular part, — sometimes to the ileo-cæcal region, occasionally to the situation of the sigmoid flexure of the colon; in some cases, in the course of the right or transverse colon; in others, above or about the umbilicus, or low in the iliac and pubic regions. In all such cases, we may suspect mechanical obstruction arising from some one or other of the following causes, which have been repeatedly discovered on dissection: —

37. *Changes observed in fatal cases.* — 1. Great distension, as if from paralysis of the muscular coat of a large portion of the small intestines, without inflammation or any other change. 2. Dilatation, with a chord-like contraction, in either the small intestines, or in the large; more frequently the latter. 3. Dilatation, with inflammation, lividity, and exudation of lymph on the serous surface. 4. This latter state, conjoined with gangrene, and either with or without exudation, occurring in the small or large intestines; more frequently in the former. 5. These changes combined with contractions, — occasionally only one, often more, the intervening parts being dilated, — in some part of the bowels. 6. Unnatural convolutions, twists, loops, or knots, in some part of the small intestines. 7. Various convolutions, or duplicatures, or twistings in the large bowel, with an appearance of elongation owing to relaxation or paralysis of the longitudinal bands of muscular fibres. 8. These latter, conjoined with recent or old cellular adhesions of the opposing serous surfaces of the duplicated portions. 9. One or more introsusceptions; the introsuscepted portion being either in a downward or upward direction, sometimes uninflamed, as in infants and children; frequently inflamed, adherent by lymph, or gangrenous, particularly in adults; and occurring in any part of the intestinal tube. 10. Old adhesions of one part of the small or large intestines to another, or to the parietes of the abdomen, or to the omentum, or some other viscus, without obstruction of the canal. 11. Similar adhesions occurring in reduced or old herniæ, or in herniæ for which an operation had been performed and the bowel returned. 12. Filamentous or cellular bands confining or encircling a portion of intestine, sometimes after reduction of hernia, occasionally in a large and irreducible hernia, and even where no hernia had existed (Garthshore, Moreau, Moscati, Walther, Abercrombie, myself, and others). 13. Adhesions of the appendix of the cæcum to some part, after passing over or around, and strangulating a portion of intestine. (See art. Cæcum.) 14. Strangulation of a portion of one side of the intestine in the femoral arch, without producing any tumour, and without obliterating, or even sensibly diminishing the canal of the bowel.* 15. Various states and forms of internal strangulation, often produced by old adhesions formed between opposing portions of the serous surface, more commonly low in, or about the middle of the abdomen, — by portions of omentum, — by rents in the omentum through which a portion of intestine had passed, and by various adhesions, obstructions, and changes in the position of parts of the bowels. 16. Strangulation in the mesentery, owing to partial adhesions (Swammerdam). 17. Various states of contraction in the small and

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* Professor ——, of Berlin, during his visit to London, was attacked the day after dining with a party of scientific men, when he sat with his back to a large fire. I was called to him, and found him in the utmost agony, with a pulse of natural frequency; his abdomen tense, tympanitic, and subsequently tender to the touch. What he vomited at first consisted of half digested substances; subsequently it was mixed with matters which had apparently come from the upper part of the small intestines. Calomel and opium were administered, and oleaginous enemata repeatedly thrown up. A flexible bougie was introduced its whole length, and large glysters were injected without difficulty; but the latter were returned soon after without any effect. The abdomen increased in size; mental distress and debility became extreme; the matters rejected by the mouth were more obviously fæculent; hiccup and leipothymia appeared, and he died in two days. An examination was not permitted. The characters of the attack suggested the idea of a paralysed state of the bowels, with inverted action of their upper portion, gradually extending downwards. The origin of the sufferings was not referred to any particular part of the abdomen, nor had any obstruction been previously complained of.

* This occurred in a female servant of the author, who was seized with ileus, without any antecedent disorder.

large intestines from organic changes in their coats, more particularly about the cæcum, sigmoid flexure of the colon and rectum, as scirrhus, fungus, soft cancer, &c. (DE HAEN, RHAN, HODGES, THOMANN, HOWSHIP, ANNESLEY, ABERCROMBIE, TRAVERS, &c.). 18. Internal polypous or malignant excrescences, or external diverticula (PORTAL, CLOQUET, COPLAND HUTCHISON, &c.). 19. Obstructions of the canal of some part by biliary and intestinal concretions, stones of fruit, bones, indurated fæces, and balls of worms. 20. The pressure of encysted or other tumours, abscesses, &c. in the pancreas, kidneys, omentum, uterus, ovaria*, or between these latter and the rectum. 21. And lastly, The circumstance of ileus being produced by herniæ, both of the more common kinds, and of those that are uncommon, as hernia of the ischiatic notch, diaphragmatic hernia, &c., should not be overlooked. Of these, and even of other internal changes productive of ileus, numerous instances are to be found in the works to which I have referred at the end of this article, at the places pointed out. (See also arts. CÆCUM, COLON, CONSTIPATION, DIGESTIVE CANAL, INTESTINES, &c.)

38. *Of Volvulus, or Ileus arising from intussusception.*—*a.* The invagination of one or more portions of intestine is not infrequently met with in post mortem examinations; and on some occasions its existence may be known during the life of the patient. The number of intus-suscepted portions may vary from one to ten; the greater number being most frequently met with in children, amongst whom invagination is also most common. In this class of patients it is frequently unconnected with any marks of inflammation; and, from the healthy appearance of the part thus affected, and the facility with which the invaginated portion is replaced, it seems probable that intus-susception has taken place, either very shortly before, or at the period of death. In the majority of instances it is an accidental consequence of pre-existing disease, most frequently of the intestinal canal, arising from an irregular action of the muscular tunics, occasioned by irritation of the mucous surface. Thus worms have been found in or near the invaginated part: and in adults it is generally observed in connection with inflammatory action of some one of the intestinal surfaces; and as a consequence of dysentery and chronic diarrhœa, particularly the dysentery of warm climates; a considerable number of the dissections which Mr. ANNESLEY made in this disease in the East Indies presenting one or more invaginations, commonly in the small intestines. I have also not infrequently found it in fatal cases of inflammation of the brain, or its membranes, in children. Although generally a fatal occurrence, intus-susception is not necessarily such. I believe that it sometimes occurs in infants, without being produced or followed by inflammation; gives rise to symptoms of ileus, or merely to slight colic; and, either with or without the aid of medicine, sometimes is restored to its natural position. In adults, however, even when it occurs without pre-existing inflammation, it almost always causes the most acute inflammatory action, often terminating in the accretion of parts, or in gangrene, chiefly owing to the strangulation of the invaginated part. Many cases, however, terminate fatally before sphacelation takes place; whilst in others, gangrene occurs during life, and the invaginated part passes off by stool; union of the opposing extremities of intestine formed by the separation of the dead invaginated part, and the ultimate recovery of the patient sometimes being the result.

39. One of the most common causes of invagination of the intestines is the inappropriate use of drastic purgatives. In all the cases of invagination observed after death from dysentery, that I have perused, purgatives had been unsparingly and unnecessarily exhibited. M. J. CLOQUET has published a case, wherein a female died of enteritis consequent upon invagination of about fourteen inches of the ileum, occasioned by a polypous excrescence arising from the mucous surface, and which, having been pushed onwards by the peristaltic action of the intestine, had dragged the part to which it was attached along with it. Costiveness is often a prelude to this change, hardened fæces, &c., producing local irritation. Intus-susceptions are most frequently downwards, and but rarely upwards. Dr. MONRO thinks that an inverted action of the bowels is requisite to the production of the latter. They are most common at the termination of the ileum in the caput cæcum. The quantity of intestine that passes within the other varies from one to thirty inches, or even more. In an infant, to the examination of which I accompanied Mr. ALCOCK, nearly the latter extent, including the ileum, cæcum, and ascending colon, was invaginated. In some rare instances, the ileum, cæcum, ascending and transverse colon, passes into the sigmoid flexure, or even as low as the rectum; or the cæcum and colon only (WHATELY, MONRO, &c.). I have met with two or three such cases in infants and children. In rarer instances, a portion of the colon and ileum has passed out at the anus.

40. *Diagnosis.*—Is it possible to distinguish volvulus or ileus owing to intus-susception, from colic or ileus arising from other pathological states? I think that symptoms may present themselves, which will, in some instances, lead the observing practitioner to infer the existence of invagination. The sudden invasion of the symptoms of severe colic or ileus after a violent straining at stool; and, subsequently, the constant desire to go to stool, attempts at evacuation being accompanied with violent tormina and tenesmus, and either unattended by evacuation, or followed by the discharge of a little bloody mucus, and these by symptoms of enteritis; are amongst the most constant concomitants of invagination. In some instances, also, the sudden occurrence of an elongated tumour, in addition to these symptoms, and before abdominal distension comes on, will further guide the opinion; particularly if the invagination be extensive, and seated in the cæcum or course of the colon. Much will, however, depend upon the precision and tact with which an examination of the abdomen is made. In all such cases, the rectum should be examined by

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* A lady, to whom I was called, had inflammation of the uterus, and an abscess formed between the upper part of the vagina and rectum, pressing upon the latter so as to prevent the evacuation of the bowels and injection of glysters. Colic, followed by ileus, took place. During an attempt to throw up an enema, by passing a male catheter up the rectum, the abscess burst into the rectum, and a large quantity of pure pus, followed by copious fæculent motions, came away, when all the dangerous symptoms disappeared.

the finger; and the extent to which enemata may be thrown up observed as an additional means of information; for whenever the intus-susception is in the colon, as much fluid cannot be thrown up as in health. Hiccup and a small irregular pulse characterise the advanced disease, and indicate the existence of inflammatory action in the invaginated bowel. When a portion of intestine is discharged by stool (as is rarely the case, the patient even recovering and enjoying health afterwards), there can be doubt of the nature of the malady. Dr. Monro mentions an instance of double intus-susception, or intus-susception of the invaginated part, communicated to him by Mr. A. Burns. I once met with such an occurrence in a child a few months old.

41. III. Of the Sympathetic and Complicated Forms of Colic; or, Colic owing to morbid States of associated Viscera.—Colic, in one or other of the forms already described, but most commonly in its first or simple state (§ 5. *et seq.*), is not infrequently caused by some other disease. Many of the authors of the last two centuries, and several contemporary Continental writers, have treated of colic when thus originating or associated as essential forms of the complaint. Although obviously only a symptom, or, at most, a part, of an important and often extensive disease, it is not the less deserving of notice when thus associated. It cannot be a matter of surprise, when we consider the relations subsisting between the different abdominal viscera, by means of the ganglial system of nerves distributed to them and influencing their functions, that disease of one of these will often change the sensibility and functions of the alimentary canal, with which it is more or less intimately connected in respect both of organisation and function. As it is useful to be aware of the various morbid associations of colic, I shall notice such as are most commonly met with in practice, with reference to the authorities who have considered them as distinct forms of the disease.

42. *A.* Sennert, Kindler, Walter, Detharding, Bonz, Tissot, Sauvages, and Schmidtmann, have noticed an *inflammatory colic;* which, however, in no respect differs from inflammation of the bowels either in an acute, sub-acute, or chronic form. Colic often rapidly passes into enteritis, and occasionally into dysentery; and, chiefly from this circumstance, together with the more phlogistic nature of the attack, and the abdominal tenderness, Cullen and Good also have distinguished a variety of the disease by the term inflammatory. In many cases, also, of chronic, sub-acute, or septic peritonitis, the muscular tunics of the intestines are paralysed, and their canal distended by flatus; the colicky symptoms predominating over and masking the inflammatory action. Hence chronic peritonitis has been often confounded with colic, as I demonstrated in a memoir on that disease published many years ago: but, in such cases, the colic is merely a symptom.

43. *B.* Hoffmann and Schmidtmann have distinguished a species of colic by the term *plethorica* or *sanguinea*, comprising under it the varieties arising — *a.* from pregnancy; *b.* from difficult or suppressed menstruation (the *Colica Menstrualis* of various writers); *c.* from suppression of the lochia; *d.* from congestion or inflammation of the uterus (*C. Uterina*, Auct. var.); and *e.* from hæmorrhoids (*C. Hæmorrhoidalis* of Alberti, Hoffmann, Nezel, Ranoë, and Rave). That colic is often associated with these affections, or is occasioned by them, there can be no doubt; but it is unnecessary to dignify these varied states of disorder, by arranging them as distinct forms of this disease. It is sufficient to notice them, so as to inform the inexperienced practitioner as to their occasional occurrence, and the importance of attending to the connection in practice; more particularly as they require a modified treatment for their removal.

44. *C.* Colic also frequently is an attendant upon acute, sub-acute, and chronic diseases of the *liver, gall-bladder,* and *ducts;* and, more especially, upon the *passage of gall-stones through the common duct.* In such cases, the colic is not infrequently associated with *jaundice.* This connection of the complaint has been fully illustrated by Baillou, Vogel, Lieutaud, Prochaska, Soemmerring, Wandeler, Witting, Conradi, &c. and should not be overlooked. (See art. Concretions — *Biliary.*) In such cases, the fixed pain in the right epigastrium and hypochondrium, extending to the back, and right shoulder-blade or shoulder, in addition to the abdominal colicky pains, vomiting, and costiveness, with or without jaundice, will assist the diagnosis. Some authors have likewise noticed the connection between colic and *disease of the pancreas.* That the latter will sometimes occasion the former cannot be doubted: but the difficulty of ascertaining the connection during life is great; more particularly as functional disorder of the duodenum, so generally present in almost all cases of colic, is readily mistaken for disease of the pancreas. (See arts. Duodenum, and Pancreas.)

45. *D.* The occasional dependence of colicky affections upon *inflammation or other morbid states of the kidney,* and upon the *irritation of calculi* in this organ, *its pelvis,* or ureter, has been long known. Such complications have occurred to every practitioner, and have been particularly noticed by Horstius, Martius, Piso, Freytag, and Cruchet: they are most frequently met with in gouty and dyspeptic subjects, and persons advanced in life.

46. *E. a.* The frequent and obvious connection of colicky affections with *worms,* particularly in children and young persons, requires no further remark than that, although the former is merely a symptom of the latter, both obviously originate in debility of the digestive functions. *b.* The occurrence of colic in the *gouty* and *rheumatic diathesis,* during the more erratic and irregular forms of these affections, and after the disappearance or retrocession of them from an external part, has been so often observed, that many systematic writers have particularised a *Colica Arthritica* (Hoffmann, Musgrave, Stoll, Bang, Brandis, Reich, Schmidtmann, &c.), and a *C. Rheumatica* (Haller, Stoll, Eyerel, Lentin, Ranoë, Thorn, &c.). *c.* The frequent appearance, also, of this affection in hysterical females, or associated with *hysteria,* is well known, and chiefly deserving of notice as respects the treatment: the intimate connection of both disorders with morbid sensibility of the organic nerves, and increased mobility of muscular parts

influenced by them, and the not infrequent dependence of them both on congestion of the uterine organs, are too obvious to require illustration. *d*. Flatulent colic is often consequent upon, and complicated with, *asthma* and *bronchorrhœa* ; owing to the impeded function of respiration in these diseases, and the discharge of gaseous fluids from the blood by the digestive mucous surface; and, when it occurs in such cases, it aggravates the original complaint. *e*. The only other complication of colic, which may be mentioned, is its occurrence with, or even after the disappearance of, *eruptive complaints*, and in connection with *scorbutic and chronic affections* of the skin. This association has been noticed by Haller, Sigaud la Fond, Schmidtmann, and others; and has been termed by some writers, *Colica Metastatica*. It is probable that, in such cases, a sub-acute or chronic inflammation of some part of the intestines takes place consecutively of the primary affection, the colic being merely a symptom of the inflammatory state. But we should recollect that, in all affections of the skin, the digestive mucous surface is more or less irritated or otherwise affected, and the allied functions disordered; and that an increase of such disorders may both change the state of the cutaneous eruption, and give rise to severe colic.

47. General Remarks on the Pathology of Colic and Ileus. — *A. The remote causes of colic.* Many of these have been particularised when describing the different forms of the disease; a few only require to be enumerated. The more common of these are cold applied to the abdomen, loins, or feet; exposing the back to the strong heat of a fire; acrid, cold, indigestible esculents; cold fluids taken when the body is overheated; solid bodies accidentally or otherwise taken, that admit not of solution or change by the juices in the prima via; irritating or poisonous substances, and the injudicious use of acrid or drastic purgatives, particularly hellebore, scam mony, and colocynth: the violent passions and emotions of the mind, as terror, anger, &c. (See § 12. *et cet.*)

48. *B. Remarks as to diagnosis and prognosis.* — An important point connected with the nature of the disease, and one which Dr. Abercrombie appears to have fully made out, is the fact of its sometimes being fatal with no other morbid appearance than great and uniform distension of the bowels. *a*. There can be no doubt that this state will of itself — without any inflammatory action — give rise to tenderness and tension of the abdomen, and thus simulate inflammation, with which, however, it is very often accompanied; and into which sudden distension of the bowels is very apt to terminate. *b*. Although *ileus* is generally the result of obstruction of the canal of the bowels, it is not necessarily so: for in fatal cases of both Madrid and lead colic, as well as in several of ileus itself recorded by Dr. Abercrombie and other authors already referred to, no obstruction was found on dissection. The cases recorded by Barthez and Maxwell also show the propriety of not losing sight of this fact in the treatment of the disease. *c*. Sudden cessation of pain, and sinking of the vital energies, are not necessarily evidence of the accession of gangrene; for they have occurred in fatal cases of colic and ileus, where no inflammatory action and no gangrene were detected; and, in some few instances, recovery has followed; and, on the other hand, as Dr. Abercrombie has remarked, extensive gangrene has been observed in cases where the pain was violent to the last. These facts confirm an opinion which I had given many years since, that the symptoms often referred to internal gangrene do not prove its accession, but the exhaustion of vital power, and of the sensibility of the organic nervous system; and that a great proportion of the instances of sphacelation found upon dissection did not exist previous to dissolution, but accompanied or followed the fatal issue. *d*. The pulse is often a most fallacious guide in every form of colic and ileus: fatal cases sometimes occur, in which the pulse, till within a few hours of dissolution, does not rise above the natural frequency; and in some cases in which there is no inflammatory action, the pulse is frequent throughout. *e*. Although fæculent evacuations are amongst the most favourable indications in the disease, they are not to be implicitly relied upon; for, when the disease is in the small intestines, much fæculent matter may have accumulated in the cæcum and colon, which may be brought away by injections without the affected part being benefited. The subsidence of the more urgent symptoms after the discharge of fæculent motions is the only sure ground of a favourable prognosis. *f*. Though the organic changes I have enumerated (§ 37.), often produce colic or ileus, they do not necessarily do so; for gradual exhaustion of the organic functions, and of life itself, without colic, may be the result. They may also exist for a long time without sensibly interrupting the functions of the bowels, until some concurrent or determining cause occurs, and suddenly developes the disease in its worst forms. *g*. The existence of spasm in some part of the intestines, so much insisted upon by writers as the cause of various states of simple, Madrid, and lead colic, as well as of volvulus, is evidently of less frequent occurrence than is supposed. Although I would by no means disallow its existence, and cannot admit, with Dr. Abercrombie, that the cord-like constriction of a portion of intestines frequently observed is its natural state, as in the case of the urinary bladder, yet it must be admitted that several symptoms, which have usually been referred to spasm, are actually owing to flatulent dilatation. Spasmodic constriction, however, evidently exists; for, independently of the occasional detection, after death, of a more constricted state of a part of a bowel than can be considered natural, we cannot explain various phenomena connected with colic and volvolus without its aid. Besides, its existence is supported by analogical evidence; for it is a principle in the human economy, that all membranous, and, *à fortiori*, all muscular, canals contract spasmodically or inordinately upon irritation of their internal surfaces. *h*. In lead colic, the last or more dangerous symptoms, whether of the complete form of ileus or not, are certainly more unequivocally attended with inordinate distension, particularly of the colon, than with constriction, even although the *sphincter ani* may be at the time spasmodically contracted. *i*. From the foregoing facts, the reader may infer that the diagnosis between colic and inflammation cannot be stated with

precision, as there is no one symptom that can be relied upon, — for inflammation with its consequences may exist, and yet the abdomen may not be painful on pressure. But it is from the manner of their association, and, still more, upon numerous minute circumstances, — some not admitting of satisfactory description, others of only casual occurrence, — and upon the age, employment, constitution, and habits of the patient, as well as from the operation of remedies, that we are to form our inferences both as to the diagnosis, and as to the result.

49. Treatment of the different Species and Varieties of Colic. — I. Of the Colic depending chiefly on functional Disorder. As soon as a practitioner sees a patient in colic, his first object is to ascertain whether or not there be strangulated or incarcerated hernia, or either tension, tumefaction, or retraction, of the abdomen, or circumscribed tumour or hardness in any part of it, or in its immediate vicinity. By the knowledge thus acquired, as well as by the information he may derive as to the cause and history of the complaint, he will be much assisted in devising an appropriate mode of cure.

50. i. *Treatment of the simple forms of colic* (§ 5.). — We have seen that these states of colic chiefly depend upon debility, or deficient vital energy of the alimentary canal, giving rise to altered sensibility of the organic nerves supplying it, to imperfect or irregular action of its muscular coat, and to interrupted or morbid secretion from its mucous surface and associated viscera. These states of disorder are to be removed, 1st, by anodynes combined with stimulants and cordials, which will generally calm the more urgent symptoms; 2d, by purgatives and enemata directed so as to excite the secretions, and evacuate retained excretions; and, 3d, by gentle tonics and cordials, in order to remove debility and promote the digestive actions; all the causes likely to reproduce the disease being carefully avoided.

51. *A.* Such stimulants as are most antispasmodic, and carminative in their action, judiciously combined with anodynes, and assisted in their operation by frictions of the abdomen with suitable sedative liniments, or by fomentations, may be first employed. Formulæ 178. 187. 211. 377. 835. in the Appendix, or the following, will generally remove the painful symptoms: —

No. 133. ℞ Aq. Menth. Virid. ʒx.; Spirit. Pimentæ (vel Sp. Anisi) ʒj.; Tinct. Hyoscyami ʒss.; Confect. Opii gr. x. M. Fiat Haustus statim sumendus. *Or,*

No. 134. ℞ Aq. Pimentæ ʒx.; Tinct. Camphor. Comp. ʒjss.; Spirit. Myrysticæ, Spir. Carui, āā ʒss.; Confect. Aromat. gr. x. Fiat Haustus statim capiendus, et pro re nata repetendus.

No. 135. ℞ Camphoræ rasæ ʒj.; tere cum Ol. Amygdal. ℥ss., et adde Ol. Lini ℥j.; Tinct. Opii ʒii.; Ol. Rosmarini ʒss. M. Fiat Linimentum, cum quo illinatur abdomen assiduè urgente flatu aut dolore.

If the simple colic evince *nervous* or *hysterical* characters, the preparations of valerian, the spirit. ammon. fœtid., &c. may be given or added to the above. If these afford not immediate relief, it will be more judicious to have recourse to laxative, oleaginous, and antispasmodic enemata, than to persist in their exhibition. Any of the formulæ in the Appendix suitable to the circumstances of the case may be directed; or the warm balsams, assafœtida, the terebinthinates, the oil or extract of rue, and infusion of valerian, may be employed in this manner, along with the oleum olivæ, or oleum lini, or any demulcent decoction. When the complaint assumes the *flatulent form*, the warm spices, or their oils, triturated with magnesia or sugar, may be prescribed, or added to the above formulæ.

52. *B.* Having relieved the more urgent symptoms in this way, — an indication the more requisite in the *spasmodic state* (§ 9.) of simple colic, and often requiring a freer use of the narcotics and antispasmodics than is specified above, — it will be necessary to act upon the bowels by purgatives given by the mouth. In most cases, a full dose of calomel, or of blue pill, is least likely to offend the stomach, whilst it is the most beneficial in its operation upon the suspended secretions: it will be advantageously followed in a few hours by a dose of castor oil, with a few drops of tinct. opii. or tinct. hyoscyami; or by the decoctum aloës comp. with the subcarbonate of soda, the tinct. of hyoscyamus and compound tincture of cardamoms, either of which may be repeated, if necessary, and its operation promoted by the enemata already particularised.

53. *C.* Having evacuated the bowels, the next object is to restore the energy of the digestive organs, and to promote the abdominal secretions. This may be done by a course of mineral waters, as the Harrogate, the Tunbridge, the Bath, the chalybeate Cheltenham waters, or the artificial waters of Pyrmont, Carlsbad, Ems, &c., and by a judicious combination of gentle tonics with laxatives and the alkaline carbonates, according to the peculiarities of the case; the blue pill, or Plummer's pill, with soap, being also occasionally given at bed-time. Sydenham recommended the Peruvian balsam, to restore the digestive functions, and prevent a return of the disorder; and certainly there are few substances better suited for the purpose than it, when judiciously exhibited, or combined with other medicines.

54. If we find the foregoing means fail of affording very marked relief, we should suspect either some degree of latent inflammatory action or a disposition of the complaint to pass into this state; and unfortunately inflammation of the bowels may proceed to a dangerous extent, without either the state of the skin, or of the pulse — without any febrile symptom — indicating its existence. This topic should not be overlooked by the young practitioner. Morgagni, Riverius, Simson, De Haen, Burseri, Schmidtmann, and Abercrombie, have demonstrated — and my experience has frequently confirmed their observations — not only that enteritis will often assume, during the greater part of its progress, all the symptoms of simple colic, but that the complaint may run its course, until the sudden cessation of the painful symptoms, without any evident cause, furnishes the first evidence both of pre-existing inflammation and of incipient gangrene. On this and other accounts, therefore, we should endeavour, in all the states of this variety of colic, to ascertain the existence or non-existence of inflammatory action, or even vascular erithism in some part of the alimentary canal. If this disorder exist, the tongue will generally be red at its point or sides, and furred or loaded in the middle; the urine will be small in quantity, or high coloured; cardialgia will sometimes be complained of; and if tenderness on pressure be felt,

it will either be independent of any marked distension of the abdomen, or it will be attended with tension and fulness, anxiety, a dark or dusky appearance about the eyes and mouth, and with thirst. Under these circumstances especially, and in the more severe attacks, particularly in the spasmodic, occurring in persons previously in health, *blood-letting* should not be omitted; and even in doubtful cases, blood may be taken either from the arm, or from the abdomen by cupping or leeches, followed by fomentations and poultices,—if there be tumefaction, by the warm turpentine fomentation and injection. Heating carminatives and antispasmodics will be injurious in all such cases, whether vomiting be present or not; and too active endeavours to procure alvine evacuations by means of purgatives given by the mouth may increase the disorder. I have derived more advantage in these cases from small and repeated doses of the sub-carbonate of soda, or the sub-borate of soda, with nitre, in camphor mixture or some aromatic water —from the use of enemata and gentle frictions of the surface of the abdomen with a rubefacient liniment (F. 311. 313.)—than from purgatives. In a few cases I have given the hydrocyanic acid, either in full doses of the oleum ricini, or in the oleum amygdal. dulcis. When judiciously prescribed, this powerful sedative has a most beneficial effect in restoring the digestive functions after the attack is removed. The hydrargyrum cum creta, or the blue pill, with taraxacum, hyoscyamus, or extract of hop, may also be given after the action of the bowels is restored.

55. ii. *Treatment of colic from injurious ingesta, &c.* (§ 10.)—*a.* The state of disorder proceeding from cold acid beverages will generally be soon removed by antacids, combined with narcotics, as ammonia, soda, magnesia, &c. given with opium, or hyoscyamus, and with cordials or carminatives (F. 179. 347, 348.); enemata and frictions of the abdomen, as already recommended (§ 51.) may be also employed, according to the circumstances of the case. *b.* When the affection is occasioned by cold, acerb, or indigestible fruit or food, it will generally be necessary to commence the treatment by an active warm emetic; and afterwards cordials, cardiacs, and enemata (§ 51, 52.), may be prescribed. *c.* If the complaint be produced by fish, Cayenne pepper is an almost unfailing antidote. *d.* If it be occasioned by smoked or tainted meat, or other esculents that have disagreed with the digestive organs, emetics, and afterwards cordials, warm aromatics, and stimulating clysters, with frictions of the abdomen, are among the most successful means. *e.* Colic sometimes is a consequence of indigestion, and of acidity or sordes in the digestive tube, often occasioned by too much or indigestible food; it then requires a combination of antacids with aperients or purgatives, as the compound decoction of aloes, or the compound infusions of gentian and senna, with soda and ammonia. After the urgent symptoms are removed, the digestive functions should be strengthened and promoted by gentle tonics and deobstruent laxatives (F. 214. 218. 362. 872.). Richter recommends for this purpose equal parts of assafœtida and the *fel tauri inspissatum*, especially in the form of the complaint proceeding from acidity.

56. The *colic of infants* has been stated to proceed chiefly from acidity of the *prima via* occasioned by the quality or quantity of the ingesta (§ 15.). The sub-carbonates of the alkalies, magnesia, and the preparations of chalk or lime, with carminatives and cordials, are therefore required. (See F. 616. 633.) A combination of magnesia with the oxide of zinc is prescribed by Richter. Magnesia, soda, or ammonia, in the aqua fœniculi dulcis or aq. anisi, and afterwards a dose of fresh castor oil; the semicupium, and, if it be requisite, an emollient or oleaginous enema, to which a little extractum rutæ, olei anisi, or tincture of assafœtida, has been added, will generally remove all disorder. If, however, these do not soon give relief, the enema should be repeated, and the abdomen rubbed with an antispasmodic liniment (§ 51, ℞ 135.). If the complaint occur about the period of dentition, the gums ought to be examined, and scarified, if any fulness or redness be remarked in them. If these means fail, those recommended in the section on *volvulus* (§ 77. *et seq.*) must be put in practice.

57. iii. *Treatment of colic from morbid secretion, &c.*—*A.* The *colic occurring in new-born infants*, from retention of the meconium, is generally soon removed by a dose of castor oil; and, if it fail, by an oleaginous clyster, or by one containing a tea-spoonful of honey and another of common salt, assisted by the semicupium, and the means stated above (§ 56.). *B.* Colic from *accumulation of fæcal matters* (§ 19.), or from constipation of the bowels, obviously requires purgatives and oleaginous or saponaceous injections. Stoll prescribed emetics in this form of the complaint, and was followed in the practice by Sims and Hosack; Riverius gave rhubarb and the turpentines; and Baglivi and Sydenham advised cathartics and anodynes in oleaginous emulsions. The preparations of sulphur, in doses sufficient to act on the bowels, have been praised by Agricola and Rave; and frictions and bandages of the abdomen have been recommended by many eminent writers. In this form of the disease, more advantage will be obtained from the repeated exhibition of medicines of a simply relaxing operation (see F. 82. 96. 430.), assisted by large oleaginous and saponaceous injections in the manner recommended by Dr. Maxwell (see § 77.), than by cathartics, which may irritate or inflame the upper parts of the digestive canal, before they can reach or affect the parts where obstruction exists. Spirits of turpentine, with olive or castor oil, when perfectly diffused and suspended in a suitable vehicle, are extremely efficacious in this state of disorder. An ounce of the spirits, with two or three of either of these oils, in about sixteen or twenty-four ounces of a mucilaginous decoction, should be slowly but steadily thrown up by means of the enema apparatus, the pipe of which may be provided with a guard, to prevent the regurgitation of the fluid. In order to facilitate the passage of this enema along the colon, the patient may be placed in bed, with the pelvis considerably elevated, and friction of the abdomen may be employed during and after the injection of it. If there be no nausea, the following may be taken, and repeated in six or eight hours, if it be requisite:—

No. 136. ℞ Potassæ Supertart. in pulv. ʒjss.—ʒij.;

Magnes. Calcinat. ʒss.; Confect. Sennæ et Syrup. Zingiberis āā ʒij.; Olei Anisi ♏ iij. M. Fiat Electuarium.

If nausea be complained of, a full dose of calomel only may be exhibited; and, after a few hours, the above electuary given, and the injection repeated; or the treatment recommended in the article Constipation may be adopted. If tenderness and tension of the abdomen, with hard, constricted, oppressed, or quick pulse, be present, inflammation should be suspected, particularly if vomiting also exist. In this case blood-letting must be practised, and the disease treated in all respects as stated in the articles on *Inflammation of the* Intestines and Peritoneum.

58. C. *The West Indian and Madrid colics* (§ 20.).—*a.* Dr. Musgrave, whose experience of *West India colic* has been extensive, recommends ten or fifteen grains of calomel to be exhibited immediately, and afterwards five grains combined with a cathartic. He likewise advises a dose of a purgative mixture to be given in the intervals, if the stomach will retain it. The intentions this physician proposes are to evacuate the bowels, and to affect the system with mercury. As soon as the mouth becomes affected, the calomel should be omitted, and alvine discharges promoted. When the spasmodic action of the bowels is severe, and signs of vascular excitement appear, blood-letting ought to be practised; this evacuation tending both to relax the bowels, and to promote the absorption of the calomel. In addition to these means, the warm bath, and terebinthinate enemata, should be employed.

59. *b.* The *Madrid colic* (§ 20.). — M. Marquand states that an emetic given at the very commencement of the attack is sometimes of use, by evacuating retained bile; but that it may be prejudicial, particularly if exhibited in an advanced period of the complaint. He recommends, as the safest and most successful practice, 1st, to calm existing irritation by opiates; and, 2d, to restore alvine evacuations. He prescribes a grain of opium every three hours till relief is obtained, which is usually the case after the third or fourth dose. He afterwards exhibits purgatives, and promotes their operation by glysters, which generally bring away copious blackish and offensive stools. The Spanish physicians have commonly recourse to the oleum ricini as a purgative in this complaint, but M. Marquand prefers scammony and jalap, as being, in his judgment, more certain and quick in their operation. This treatment is the same as that long since recommended by Mr. Quier, in the dry belly-ache of the West Indies.

60. iv. *Treatment of lead colic* (§ 25.). — In this variety of the complaint, as well as in those forms which have received the denomination of Madrid, West Indian, or hepatic colic, the hepatic ducts and gall-bladder are obviously obstructed or loaded by morbid bile; the irritation caused by which most probably occasions spasm of the common duct, duodenum, and parts in the vicinity, in the early stages of the disease. Very different, and even opposite, modes of treatment have been recommended in lead colic. *a. Blood-letting* has been directed by Calmette, Astruc, Christison, and Gregory; whilst other writers, as Dubois and Dufresne, have considered it either unnecessary or injurious. I have prescribed it in some cases with manifest advantage, the state of vascular action evidently indicating the propriety of resorting to it; but, in others that I have seen, it obviously would have been injurious. When the face is flushed, the skin hot, and the pulse full or accelerated, it is both safe and requisite. *b.* The use of *opium* has the support of the ablest writers on the disease — of Grashuis, Riedlin, Stoll, Schlegel, Reynolds, Baker, Adair, Eyerel, Warren, Wolff, De Haen, and Gendron; but they are not agreed as to the period of exhibiting it. Sir G. Baker commenced with purgatives, whilst De Haen, Darwin, Warren, and Bateman began with opium, and gave purgatives afterwards. Dr. Pemberton advised a combination of both — of laudanum with castor oil. It appears to me preferable to combine the first dose or two of opium with calomel, as recommended by Burger, particularly if the functions of the liver be obviously affected, as they often are, and if the stomach be irritable, as it generally is in the advanced state of the disease. But the dose of calomel should be large (from 10 to 20 grains), and not repeated oftener than once or twice. This combination will frequently of itself open the bowels; but whether it does so or not, *purgatives* ought to be exhibited, and their operation promoted.

61. *c.* As to the propriety of having recourse to this class of medicines, there is no difference of opinion, however much sentiments may vary as to the choice which should be made of them. Grashius, Mosely, Fischer, Friese, and Odier prefer the *oleum ricini*. Burger advises it to be given with manna; Eyerel, after blood-letting, with emollients and opium; and Tissot in clysters. Several writers prefer the combination of antispasmodics and sedatives with purgatives, on the supposition that the obstruction of the bowels attendant on the disease arises from spasm in some part of them. But, as Dr. Cheyne and Dr. Abercrombie have justly contended, it is quite as much owing to distension, from a paralytic state of the muscular coat, that the obstruction occurs, as to spasmodic constriction. According to this view, little benefit can result, as respects the operation of cathartics, from combining them with antispasmodic anodynes, unless with such as may stimulate the intestinal canal; and, in fact, such seems to be the result of observation. Some writers, conceiving that lead colic may arise from the presence of the acetate or the oxide of lead in the prima via, have recommended the *sulphate of magnesia* with the view of forming an insoluble sulphate of lead. The experiments and views of Orfila, Good, and Dr. Paris, seem to favour the employment of this sulphate as well as the sulphate of alumina, exhibited with an excess of acid, or in the compound infusion of roses; and certainly unequivocal benefit results from the practice. But whether that benefit arises from reducing the lead to an insoluble salt, or from the operation of the sulphates in exciting the action of the partially paralysed muscular coat of the bowels, and thereby enabling them to expel retained matters of a morbid or noxious description, cannot readily be determined. We have no evidence of the existence of lead in the prima via to an extent that admits of detection, nor has the formation of a sulphate of lead been demonstrated. I am

therefore inclined to adopt the other mode of explaining the operation of these salts. I have found the *croton oil* an excellent purgative in this disease, particularly when it is added to either *castor oil* or the oil of *turpentine*, or to both. I have in one or two cases caused the croton oil to be rubbed over the abdomen in this species of colic, with the hopes that it might act upon the bowels; but I did not obtain this effect. The quick irritation of the skin, however, that it produced, evidently proved salutary. *Sulphur* and its preparations, as well as sulphureous waters, have been prescribed by LUZURIAGA in the Madrid colic, in which they are obviously beneficial; and subsequent writers, particularly GARNETT and HAHNEMANN, proceeding on the erroneous opinion that the Madrid colic is identical with lead colic, have recommended them also in the latter: but, as ORFILA has expressly stated, they are most dangerous remedies in true lead colic. A case demonstrative of this fact occurred in my practice many years ago, and was published in the *London Medical Repository* for October 1822. The deleterious effects are there ascribed to the absorption of sulphur, which was taken by the patient, contrary to my advice, in order to counteract the habitually costive state of his bowels.

62. *d.* The *sulphate of alumina* has been given by some modern physicians, with the view already stated (§ 61.); but with many its exhibition has been altogether empirical. GRASHUIS, QUARIN, ADAIR, FISCHER, SCHLEGEL, LINDT, PERCIVAL, MICHAELIS, GEBEL, and SOMMER favour the use of it, either alone or with mucilaginous and narcotic medicines. I believe that its efficacy is much enhanced by giving it with camphor, opium, and demulcents. SCHMIDTMANN details a case, in which the exhibition of two or three doses of alum produced a most copious operation on the bowels, after the most active purgatives had been given by the mouth and *per anum* without any effect. When residing on the Continent in 1818 and 1819, I saw many cases treated by this substance, given in doses of from a scruple to two drachms in gum-water, or with camphor and opium. M. KAPELER, in his hospital, into which many cases of the disease are admitted, employed scarcely any other medicine than alum dissolved in mucilaginous decoctions, assisting its action by oleaginous clysters. The worst cases, — those with paralysis, loss of sight and hearing, violent cephalalgia, tremors of the muscles and limbs, &c. were restored in a much shorter time by this than by any other treatment, and with much less disposition to relapse, or to pass into a paralytic state. I have employed alum with uniform success in several cases, and combined it with camphor, Cayenne peper, and occasionally with opium; and have always found that, when given in sufficient quantity, — from two to four or five drachms in the twenty-four hours, and assisted by oleaginous clysters, — it will open the bowels more certainly than any other medicine. M. GENDRIN has recently given alum in fifty-eight cases of this disease, all of which recovered in from three to five days. He has also found that a drachm, or a drachm and a half, of *sulphuric acid* in the twenty-four hours, taken in three or four pints of water, is equally prompt and efficacious. The *sulphate of zinc* was recommended by Dr. MOSELY, seemingly from considering its operation analogous to that of alum; and the sulphate of copper was mentioned by HARRISON.

63. *e. Mercury* has been very generally prescribed in this complaint, particularly by CLARK, HUNTER, WARREN, BISS, BURGER, CLUTTERBUCK, and others; but with very different views. Some have given it simply as a chologogue purgative; and others with the intention of preventing the accession of paralytic symptoms; although it is by no means obvious how it can have this latter effect, since these symptoms seldom originate in structural change in any part of the cerebro-spinal axis, when they occur during or after lead colic. Those who have prescribed the preparations of mercury with this latter view, as CLARK, WARREN, and BISS, have pushed it to the production of salivation; but, although I admit that salivation will speedily alleviate the abdominal symptoms, yet I am of opinion that it will rather favour than prevent the accession of paralysis, the more especially as I have observed this affection to follow, notwithstanding the salivation which had been produced with the hopes of preventing it.

64. *f.* Besides the foregoing means, various others have been recommended by writers on the disease. Dr. ROBERTS has detailed two cases in which the *nitrate of silver* was internally exhibited with apparent benefit. *Tobacco* in various forms has also been prescribed. BARTHOLINUS was the first to employ this plant in the treatment of colic, by directing its smoke to be thrown up the rectum — one of the safest and most beneficial modes of using tobacco internally. Dr. GRAVES has derived much benefit from compresses, moistened with a strong decoction of it, applied over the abdomen; and from croton oil internally, assisted by clysters. *Emetics* have been recommended by some writers; but they are required only after lead has been taken in poisonous doses, or at the commencement of the attack, when the biliary organs are loaded by vitiated bile. They, however, form a principal part of the treatment usually adopted in the Parisian hospitals. *Cold* and *warm baths* have both been mentioned by writers as being sometimes of service; but I consider the former attended by some risk, and the latter seldom required, although occasionally palliating the more painful symptoms. The propriety of having recourse to *external irritation* in this disease has been admitted by many of the writers already referred to, and *blisters* and various other means of a similar kind have been adopted. In several cases I have, however, found more advantage from one of the liniments above recommended; or, if an irritating effect was desired in a short time, I have obtained it from either increasing the more irritating ingredients contained in these liniments, or applying a cloth moistened with one of them closely to the abdomen. The *hot turpentine fomentation*, or a few drops of croton oil rubbed on the surface of the belly, will have a similar effect; but the former of these, accompanied with suitable internal medicine, is the most rapidly efficacious.

65. *g.* The great number of cases of this disease admitted into the hospitals "*La Charité*" at Paris, and "*Hotel Dieu*" at Orleans, naturally

attracts attention to the plans of cure which are there adopted; but at neither of them is the treatment so simple or so quickly beneficial as that adopted by M. **Kapeler**, and already stated. At La Charité the treatment consists chiefly of emetics, purgatives, sudorifics, and opiates; and at several of the French hospitals large local depletions are also employed. But the whole plan of cure is generally complex and distressing to the patient. M. **Ranque**, of the "*Hôtel-Dieu*" at Orleans, states, that of about 150 cases he treated, he did not lose one. He commences with the semicupium; and afterwards applies on the abdomen and loins a large plaster, consisting chiefly of diachylon, conium plaster, camphor, and tartarised antimony. This is allowed to remain until pustules come out, and the pained parts are rubbed with a liniment, the active ingredient in which is the extract of belladonna dissolved in sulphuric ether. He next administers, once or twice daily, an enema with four ounces of olive or almond oil, and twenty drops of the ætherial tincture of belladonna in the linseed decoction; and prescribes, when the sufferings are severe, small doses of the same tincture to be taken at the same time in a demulcent mixture. This treatment is persisted in for three or four days; and if considerable relief has not been obtained at the end of this time, castor oil is given in small and repeated doses, the anodyne liniment is assiduously employed, and the plaster on the loins and abdomen is renewed, with an increased quantity of camphor and tartarised anatomy. Although this plan of cure appears to be very successful, yet relapses are very frequent after it.

66. *h*. The *treatment adopted by the Author* in lead colic is directed with the views, 1st, of relieving the sufferings of the patient; 2d, of evacuating the retained secretions, which are always remarkably morbid, and apparently the cause of the phenomena constituting the fully developed disease; and, 3d, of imparting energy to the weakened nerves, and parts that they supply. In fulfilling these intentions, the practitioner is often placed in a practical dilemma, from the circumstance of the medicine, which is most to be depended upon in relieving some of the most urgent symptoms, and enabling the liver to throw off the load of morbid secretions which oppress it, having the effect, in some constitutions especially, of increasing the exhaustion of nervous power, and the tremors and paralysis attendant on the worst forms of the complaint. *Calomel*, in a large dose, either alone or with *opium*, has an excellent effect in allaying the distressing irritability of stomach, and carrying the biliary and other morbid secretions downwards: but if it be repeated in such quantity oftener than once, or if free evacuations be not procured soon after its administration, it is apt to affect the mouth, and to prolong the period of convalescence. I have, therefore, endeavoured to procure from it a soothing effect on the stomach, along with its chologogue operation, guarding against its secondary action on the system; and have prescribed from ten to twenty grains in a bolus, with about ten grains of *camphor*, and sometimes with two of opium. This will generally allay the retchings, and enable the stomach to retain the medicine next to be given. About three or four hours after the above has been taken, a draught, consisting of half an ounce each of *castor oil* and *oil of turpentine*, with one or two drops of *croton oil*, on the surface of aqua pimentæ, is administered, and its operation on the bowels promoted by a clyster composed of about four ounces of *olive oil*, or two of castor oil, one of turpentine, half an ounce of *sulphate of magnesia*, and from ten to twenty ounces of the decoction of linseed, or of marshmallows. This enema should be steadily thrown up by the improved apparatus. Whilst this treatment is proceeding, a *liniment* may be assiduously rubbed on the abdomen, and on the limbs, if much pain be felt in them; or a piece of flannel charged with one of these liniments (F. 297. 307., &c.) may be closely applied over the belly. If these means procure evacuations, recovery will soon follow; but if the draught be thrown off the stomach, or the injection be returned without effect, they should nevertheless be repeated. If the abdomen be much distended, and painful on pressure, the hot turpentine fomentation ought to be applied, as long as the patient can endure it, instead of the liniment. These measures will seldom fail of procuring most copious evacuations, which should be promoted by sulphate of magnesia, and spiritus æther. sulph. comp. in the compound infusion of roses; and by oleaginous clysters with camphor or assafœtida, and oil of linseed. After two or three doses of sulphate of magnesia have been given, the following draught may be exhibited, and repeated frequently; the action of the bowels being promoted by the enema.

No. 137. ℞ Camphoræ rasæ gr. iij.—vj.; tere cum Mucilag. Acaciæ ℥ ss., et Aq. Pimentæ ℥ j.; Sulph. Alumin. pulver. ʒ ss.; Spirit. Anisi ʒ j.; Syrup. Croci ʒ ss. Misce. Fiat Haustus, quartâ vel quintâ quâque horâ sumendus, prius agitata phiala.

No. 138. ℞ Terebinth. Venet. vel Commun. ʒ vj.—℥ j.; Tinct. Assafœtidæ ℥ss. (vel Ol. Anisi ʒ j.); Olei Olivæ ℥ iij.; tere cum Vitel. Ovi, et adde Decocti Malvæ ℥ xvj., in quo prius soluta erat Sulphatis Magnesiæ ℥ ss.—℥ j., et fiat Enema.

67. *i*. The *treatment of convalescence* from lead colic is of much importance, particularly when attended with tremors, epilepsy, severe cephalalgia, or paralysis. At first the *alum* and *camphor* should be given for two or three days; and the action of the bowels promoted by oleaginous enemata; the loins and abdomen being rubbed, night and morning, with one of the liniments already recommended. As there is a great tendency of the disease to return, particularly when the patient follows the occupation which occasioned it, the strictest attention should always be paid to the state of the bowels, and the sulphates of magnesia and alumina, with compound infusion of roses, and some aromatic spirit, be taken frequently; and, upon the first indication of obstruction, recourse should be had to oleaginous clysters.

68. *k*. In order *to remove the sequelæ* of the disease, particularly the *paralysis*, the patient should be allowed a generous diet, with exercise in the open air; and *strychnine*, or the extract of *nux vomica*, with the aloes and myrrh pill, or F. 541. 565. may be taken twice or thrice daily. The palsy arising from the poison of lead is much benefited by this active medicine, as well as by frictions with stimulating substances, by electricity, and the use of splints along the fore-arm and hand, as recommended by Dr. **Pemberton**. The Bath waters are very serviceable in promoting perfect

recovery, and preventing a relapse: with these views, the balsams, particularly the Canadian and Peruvian, may also be taken, with the sulphates of alumina and quinine, or with tonic extracts, camphor, &c.; and, under every circumstance, the digestive organs should be strengthened and the action of the bowels promoted by tonics combined with aperients and antispasmodics. I have obtained marked advantage from strychnine thus combined, as well as from several of the gum resins, as ammoniacum, myrrh, assafœtida, and galbanum, particularly when, besides the reduced nervous and muscular power, the digestive funcions still continued to suffer. (For the *prophylactic treatment* of this disease, see the article Arts and Employments, § 17—30.)

69. II. Treatment of Colic caused chiefly by Change of Structure or Position. — i. *Of colic from constriction of the bowels.* This state of disease will not be benefited by purgatives or carminatives; but a judicious choice and combination of aperients will often be of service. In all cases of this description, due examination *per anum* should be instituted; and as stricture frequently occurs at the upper part of the rectum and lower part of the sigmoid flexure of the colon, a very long flexible bougie should be carefully introduced, as recommended by Dr. Willan. When we have reason to suspect the existence of stricture in any part of the colon, the use of mucilaginous, saponaceous, or oleaginous enemata should be long persisted in; but the patient ought to be very careful not to employ any oil that is not perfectly sweet. At the same time, the action of the bowels may be promoted by an electuary composed of equal parts of the supertartrate of potash and sub-borate of soda, with confection of senna and common treacle, or either the inspissated juice of the sambucus, or simple syrup. I have seen advantage derived from a plaster, consisting of the emplastrum picis comp., the emplast. ammoniaci cum hydrargyro, and either the extract. belladonnæ or the extr. conii, kept long applied over the abdomen. When the stricture appears to be low in the colon, and yet beyond the reach of a bougie, *suppositories*, with either of these extracts and the lead plaster, will be productive of some relief; and when it can be reached by a bougie, the occasional introduction of one will often permanently remedy the disease.

70. Most of the cases of this complaint that I have seen, have occurred in persons who had long been in the habit of having recourse to purgatives, consisting chiefly of calomel and colocynth, or the compound extract of the latter — substances which have a remarkable effect in irritating the internal surface of the colon and rectum, and constricting their muscular tunics. It is obvious that a frequent repetition of these medicines, unless their effects be counteracted by emollient clysters, will at last give rise to inflammatory thickening of the parietes of the bowel, aud constriction of its canal. In most of these cases, also, there exists inflammatory action of the internal surface of the constricted part, and of its vicinity. Hence the advantage usually derived from a cooling regimen, a spare or farinaceous diet, and cooling gentle laxatives, assisted by soothing and demulcent clysters, as the following: —

No. 139. ℞ Semin. Fœnicul. dulc., Semin. Anisi, āā contus. ℥ss.; Fol. Malvæ et Flor. Anthem. āā ʒ vj.; Aquæ O jss. Coque ad O j.; dein exprime, et adde liq. expresso Olei Olivæ, vel Ol. Lini, ℥ iij.; Potassæ Tartar. et Sub-boratis Sodæ āā ʒ j.—ʒ ij. Misce et fiat Enema, pro re nata injiciendum.

No. 140. ℞ Extr. Hyoscyami ℈ ij.; Camphoræ rasæ gr. vj.—x.; Sodæ Sub-carbon. vel Sub-boratis ʒjss.—ʒ ijss.; Potassæ Nitratis ʒ ss.; tere cum Mucilag. Acaciæ ℥ vj., et adde Decoct. Papaveris ℥ x.—xx. Misce et fiat Enema.

No. 141. ℞ Extr. Belladonnæ gr. iij.—vj.; tere cum Decoct. Cydoniæ (vel Decoct. Althææ, vel Dec. Hordei Comp.) ℥ xij.—xvj.; et adde Potassæ Sub-carbon. ʒ j.; Potassæ Nitratis ℈ j. Misce pro Enemate.

71. ii. *Treatment of Ileus.* — The importance of ascertaining, previously to the adoption of a plan of treatment in this state of the disease, the existence of hernia, has been already noticed; but the young practitioner should be aware that hernia may exist without the patient being aware of it; and the real state of the case may be mistaken, owing to the absence of any tumour, so very small a portion of the side of the bowel being strangulated as not even to obstruct its canal. I have twice or thrice — once in one of my servants — met with such cases, in consultation with eminent surgeons, where the exact state of parts was inferred, and a successful treatment pursued. There are certain forms of the disease which may be briefly characterised, as they require a very different treatment: — 1st, Great distension of the abdomen, with diffuse, but not acute tenderness; obstinate costiveness; retchings, particularly when substances are taken into the stomach; anxiety, and general uneasiness: 2d, The above symptoms, with fixed and severe pain, and great tenderness, felt in a defined part of the abdomen, often about the region of the cæcum: 3d, Violent attacks of tormina, occurring in paroxysms, like the strong impulse downwards from the action of a drastic purge, — the action proceeding to a certain point — there stopping, and becoming inverted, — followed by vomiting, which soon becomes feculent (Abercrombie): and, 4th, Where the symptoms of the third state are accompanied with tenesmus, and the discharge of a small quantity of bloody water or mucus, sometimes with indistinct or elongated tumour, and the other signs already described (§ 40.) as indicating invagination of the bowels.

72. In the *first* of these the bowels are evidently distended and inactive; — in the *second*, they are probably in a similar state, owing to obstruction, stricture, or strangulation, with inflammation, most frequently in the vicinity of the cæcum and its appendix; — in the *third*, there are more evident signs of stricture or strangulation; but this may also be an advanced stage of the second; — and in the *fourth*, the symptoms are more strictly referrible to invagination; although this may also exist in the third of these states.

73. *A.* It is evident that the *first* of these states will very frequently be much benefited by *purgatives*, particularly by a large dose of calomel (from 10 to 20 grains), which will, either alone or with camphor and hyoscyamus, allay the morbid action of the stomach, and move the bowels, particularly if it be assisted by the hot turpentine fomentation or epithem (§ 54.), and by enemata (§ 57. 66. 70.). In cases where a full dose of calomel only has been given, a dose of castor oil, with ten or fifteen drops of laudanum, may follow it in one or two hours; and an injection with three times the quantity of the same medicines may afterwards be thrown up. In some instances

equal quantities of castor oil and turpentine may be given soon after the calomel. After the irritability of the stomach has subsided, the action of the bowels may be promoted by small doses, frequently repeated, of the purified *extract of aloes*, with hyoscyamus, and a small quantity of extract of gentian, which will promote its action. GALLESKY states that he has found recently expressed *linseed oil*, in the dose of a large spoonful, with a few drops of the oil of aniseed, given every hour or two hours, extremely beneficial. If the first dose of calomel neither opens the bowels nor allays the action of the stomach, it may be combined with from one and a half to three grains of pure opium. This will, in most instances, settle the stomach and open the bowels, particularly if it be soon followed by the fomentation and enema already advised.

74. *B.* The tendency of colic to lapse into a latent or obscure state of inflammation has already been noticed (§ 54.); and this tendency is the greater, the more nearly the disease approaches to ileus from its commencement. As colic in every form is more especially an affection of the muscular coats of the bowel, and as inflammation, when it supervenes, as it so frequently does, upon colic, seems to attack this part especially, and to terminate then more rapidly in gangrene than when it originates in either the mucous or peritoneal coats, so it becomes necessary to have a prompt recourse to *blood-letting*, particularly when rigors have occurred, and the pulse is oppressed or constricted, and the habit of body plethoric or muscular. In such cases, blood-letting should be full and decided, and, if necessary repeated; but it ought not to be trusted to alone, or even mainly; for if carried too far, or employed too largely, or even at all in some cases and states of constitution, or too late in the disease, it may hasten a fatal termination. It is beneficial chiefly in the *second* and *third* states of the malady, especially when resorted to early, and followed by local depletion, by calomel and opium, the warm turpentine fomentation on the abdomen, and subsequently by clysters (F. 144. 146, 147.). I believe, however, that in many cases, particularly those commencing as flatulent colic, blood-letting carried to the utmost extent will not of itself prevent either gangrene from taking place, or fæculent vomiting from coming on. For in these, and in the *first* state above specified, the muscular and other coats seem to lose their vitality, without almost any other mark of pre-existing inflammation, that I could observe in some cases on dissection, than change of colour. And yet, when duly employed, particularly early in the other states of the disease, blood-letting will often give decided and immediate relief, and be quickly followed by free evacuations and speedy recovery.

75. *C. Opiates and other anodynes* are most important remedies in nearly all the states of the disease, but especially in the *second* and *third* particularised. The propriety of premising general or local blood-letting, or both, when it is clearly indicated, and the advantages of combining opium or hyoscyanus, at first with a large dose of calomel, or camphor, or both, have been adverted to. These remedies will often of themselves produce free evacuations; but in the states of ileus now mentioned, *purgatives* given by the mouth, unless of the mildest kind, or combined as above (§ 52.), and exhibited subsequently to the above remedies, are seldom of service. Appropriate enemata, however, should not be omitted.

76. *D.* The *tobacco injection* is one of the most generally adopted remedies in this disease, and one which has received the warm sanction of Dr. ABERCROMBIE. This able physician recommends it with judicious caution, and directs at first only fifteen grains of the tobacco to be infused for ten minutes in six ounces of boiling water; the quantity to be increased to twenty grains, and repeated after an hour, if no effect be produced. I believe that, when thus employed, early in the disease, and in persons previously of sound vital power, this will often be of service, or at least not detrimental. But I have seen several cases wherein this powerful substance, even when no more than half a drachm had been infused for fifteen minutes in a pint of water, produced the most distressing effects; and in one case, where it was given in opposition to my opinion, which was in favour of a terebinthinate injection, death followed its administration before three minutes had expired, — evidently from its sedative operation in an advanced state of disease. I have seen many cases in which it had been administered, and, unless under the circumstances in which I have stated it to be admissible, or when stimuli are given at the same time by the mouth, I believe that it favours a fatal termination, by exhausting the vital power of the alimentary canal, and disposing inflammatory action to terminate in gangrene. The introduction of *tobacco smoke* into the large bowels appears a much safer and more efficacious practice, and to be appropriate to a greater number of the many morbid states of which ileus is an effect.

77. *E.* Various *other kinds of injection* have been recommended; and some of them are more deserving of confidence in the treatment of ileus than almost any other remedy. I have already mentioned several (§66.70.), and referred to others in the Appendix (F.140, 141.150.), on which very considerable reliance may be placed. Dr. MAXWELL has found large injections of *warm linseed oil* —from two to four pints—steadily and slowly thrown up, regurgitation being prevented by pressing the guard of the pipe against the anus, remarkably successful, after fæculent vomiting had come on, and the usual means had failed. He recommends, in such cases, the patient to be placed on the right side, with the pelvis elevated above the rest of the body, the premature return of the injection being prevented by firmly pressing a ball of linen against the anus. He directs this clyster to be repeated every three or four hours, until relief is obtained; and, when much exhaustion is present, with the addition of laudanum. This physician likewise advises, in cases where the existence of intus-susception is suspected, the *inflation of the intestines by air*, and adduces cases in which it was followed by copious evacuations; but it seems doubtful whether or not invagination existed in any of them. This practice, first recommended by HIPPOCRATES, afterwards insisted on by ALEXANDER of TRALLES, ZACUTUS LUSITANUS, and RIVERIUS, and mentioned by SAGAR, and some other systematic writers, is certainly deserving of trial where we have reason to suspect invagination or internal strangulation.

In most cases, however, inflation with *tobacco smoke* appears preferable; but, as Quarin remarks, it should be frequently repeated, and its effects carefully watched. Although the infusion of tobacco has been chosen for injection by Vicat, Fowler, Campet, Conradi, Hufeland, and Abercrombie, yet I agree with Sydenham, De Haen, Sagar, Quarin, and many others, in considering the smoke superior to the infusion; the former being adopted by some merely on account of the greater facility of conveying it into the bowels, and without reference to the very different operation of these two modes of employing this powerful medicine. But in cases where inflation by air or tobacco smoke is adopted, purgative injections should speedily follow, as directed by Hippocrates, if evacuations have not taken place; for the smoke may even pass out by the mouth, and yet copious motions may not otherwise be procured. Besides these means, *yeast* has been administered as an injection in warm small beer, with the intention of evolving its fixed air in the bowels, and thereby extricating any unnatural convolution or slight invagination that may have been formed. *Sulphuric æther* has likewise been thrown into the large bowels, with the expectation that its fumes would operate in a similar manner. *Antimonial wine*, and the *powder* or *infusion* of *ipecacuanha* have been prescribed in enemata, with the view of relaxing spasm, in cases where it is presumed to be the chief cause of obstruction; whilst the infusion of poppies and of chamomile flowers, various anodyne, saponaceous, laxative, and oleaginous injections (§ 57. 66.), have also been directed with the views already stated.

78. *F. Baths, &c.* — *Tepid* or *warm baths* are sometimes useful adjuvants in the early stages of the disease, and are generally recommended. *Cold fluids* taken into the stomach, and thrown into the large bowels, in considerable quantities, und *cold epithems* constantly applied on the abdomen, have been prescribed by Bureau*, Maret, Ranoe, Steidele, Darwin, Conradi, Baldinger, Smith, and Abercrombie. The dashing of cold water over the lower extremities and abdomen of the patient, whilst he is kept in a standing posture, has likewise been directed by several physicians; but this practice, although occasionally of service, seems less successful than the judicious application of cold to the surface of the abdomen itself. When this cavity is distended, tense, painful on pressure, particularly in a circumscribed portion, with increased temperature of its surface, the cold douche, or the application of cloths moistened with vinegar and water, will often prove of advantage. Dr. Brandis, of Copenhagen, states that he has employed iced drinks, and cloths wetted with iced water to the abdomen, in ten cases with success; and that in some instances the practice requires to be persevered in for a long time, and assisted by antispasmodic and laxative enemata, and by opiates with stimulants and tonics taken internally.

79. *G.* When signs of depression of the vital energy manifest themselves in the advanced stage of the disease, *stimulants* are required, and, if judiciously selected and combined, their exhibition will sometimes be rapidly followed by amendment. Wherever the lowering measures already noticed are followed by increase of the symptoms, particularly vomiting and restlessness, or by sinking of the nervous power or of animal heat on the surface of the trunk, antispasmodic stimulants and tonics should be conjoined, according to circumstances, with certain of the measures described above. Purgative tinctures are sometimes of service in this state, particularly the tinctures of aloes, with liquor potassæ, and tinct. hyoscyami; and the tincture of senna, with spirit. ammon. succinati and spirit. anisi, in large or often repeated doses. Notwithstanding constant or even fæculent vomiting in this stage, advantage will sometimes be derived from a full dose of *unrectified oil of turpentine* (from ʒ iv.—x.), taken on the surface of aqua pimentæ, to which either spirit. anisi, tinct. cardamom. co., or tinct. capsici, has been added. I have seen the vomiting cease, and the distension of the abdomen rapidly subside, immediately after this draught, which should be repeated if the former has been thrown off. A full dose of common oil of turpentine, taken by the mouth, has a singular effect in constricting, and, as it were, drawing the small intestines close to the root of the mesentery; so that, in cases where I have given it, and in which hernia had chanced to exist, the hernial sac has become quite empty soon after its exhibition. May not the advantage obtained by it occasionally arise from the disentanglement of a constricted or imprisoned portion of intestine by this mode of operation, as well as from its influence in restoring the action of the paralysed and dilated coats of the bowel in other cases? In many states of inflammatory action, particularly those attended with exhausted tone of the capillaries and depressed vital power, it is one of the most active means we possess of preventing gangrene or effusion, and of restoring the natural action of the vessels.

80. *H.* In some cases, after depletions have been carried far, or in nervous and irritable habits, the inverted action of the stomach and upper part of the alimentary canal appears to continue in consequence of the vital exhaustion and irritability of parts; but, if these states were put a stop to for a while, and the powers of life supported, the natural action of the bowels — respecting the immediate restoration of which the patient is often injuriously harassed — would generally at last return. Under such circumstances, pills consisting of the *oxide of bismuth*, *camphor*, and *opium*, frequently repeated; or of the first of these, and extract of *hop*, or of *henbane*, or the *hydrocyanic acid*, in the recent oleum amygdal. dulcis, or oleum olivæ, in moderate but rather frequent doses, and occasionally with an aromatic spirit or distilled water; will often prove of service, particularly when aided by the external means about to be recommended. When thus exhibited, the prussic acid has a restorative effect; and it is still further beneficial when associated with suitable stimulants, as camphor, æther, &c. In a few instances I have inferred, from the situation of the pain, and other symptoms, that the disorder originated in the duodenum or jejunum; and in these especially, the oxide of

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* Mr. Bureau recommends the use, and gives a plate descriptive, of a simple hydraulic apparatus for injections, the same in all respects as one lately introduced into this country from France, under the name of clysmaduct, but which is suited only to the injection of water.

bismuth and the prussic acid have been of considerable benefit. The *ammoniated tincture of guaiacum*, with *paregoric elixir*, in full doses, and given in milk, or in the recent oil of almonds or of olives, or in linseed oil, has also occasionally proved of advantage. The *acetate of morphine* is sometimes of service in allaying the distress, anxiety, and irritability of the stomach and diaphragm; but it should be prescribed in an aromatic spirit, and in a dose which will secure its anodyne effect without sinking the vital energies. I have used the following with marked advantage, repeating the dose every two hours until an effect was produced: —

No. 142. ℞ Acetatis Morphinæ gr. iv.; Spirit. Myristicæ et Spirit. Pimentæ āā ʒj.; Spirit. Camphoræ et Tinct. Benzoini Comp. āā ℥ ss. Solve. Capiat ʒj. ad ʒij. in Saccharum, vel Syrupum, vel Olea supra memorata.

81. *I.* The *ingestion of crude mercury*, or of *globules of lead*, to the extent of one or two pounds, has been recommended in ileus by several authors, particularly in that state of the malady which presents the symptoms indicating invagination of a portion of intestine. Sydenham, Schenck, Belloste, Paré, Panzani, Hoffmann, Sagar, Quarin, Nevinson, Darwin, Abercrombie, and many others, have noticed this practice; some of them, as Sydenham and Quarin, in doubtful terms — others more favourably. M. Rolland has detailed the history of a case, wherein, other means having failed, he gave about 10 ounces of crude mercury, which, after a short time, occasioned a sensation of change in the position of some part within the abdomen, instantly followed by relief. Similar instances have been recorded by Dr. Uwins and Dr. Belluci. I have never tried this metal; but, many years ago, I saw a patient—a female between twenty and thirty, — relieved from all the characteristic symptoms of this state of the disease by the ingestion of about two pounds of common shot, which also has been recommended in volvulus, by many of the best medical writers of the three last centuries, and by some of them in preference to quicksilver. Large blood-lettings, the tepid bath, and various other means (§ 54. 77.), should generally precede the ingestion of lead or quicksilver.

82. *K.* Various *external means* besides those already noticed, have been recommended in ileus. Sagar[*] states, that he was cured of volvulus, by having the abdomen, at the commencement of the attack, kneaded like dough, with oiled hands, — a plan instituted evidently with the view of disentangling a displaced portion of bowel. Aretæus, and Paul of Ægina, directed *cupping* on the abdomen. Celsus advised *dry cupping* on both the loins and abdomen; but little advantage can be expected from this latter measure, unless it be performed by one capacious vessel, as is, I believe, occasionally done in some northern continental countries. Quarin states, that in an extreme case, all other means having failed, and the pulse being small and irregular, the extremities cold, the countenance sunk, with hiccup, &c., he had recourse to dry cupping, using for the purpose porcelain bowls. Relief soon followed, and the bowels were copiously evacuated, their action having been assisted by enemata of infusion of chamomile flowers and tartarised soda.

83. *L.* Dr. Abercrombie expresses himself in favour of *large blisters* on the abdomen; but much more certain and immediate relief — often within ten minutes after its application — is derived from the hot *spirit of turpentine fomentation*, placed over the whole abdomen. Where there is little or no tenderness of this cavity, I have, however, preferred inunction of its surface with one of the liniments above directed (§ 51.); keeping subsequently a cold turpentine epithem applied. Forbes, Wilmer, and Baldinger also advocate the use of blisters on the abdomen; but Meier prefers placing them on the insides of the thighs. The recommendation of Sydenham, to keep a young dog constantly applied to the abdomen, will appear to many a singular remedy; but the views with which he prescribed it are by no means devoid of reason.

84. *M.* Numerous writers antecedent to the time of Quarin, and subsequently, have recommended *an incision* to be made *through the parietes of the abdomen*, and the internally strangulated, or the invaginated, portion of bowel extricated through it. Nuck has recorded a case where this operation was performed with success. Van Swieten objects to it, the uncertainty of the existence of volvulus or internal strangulation. But, in several cases of invagination which I have seen, and in a great many I have perused — almost all those, the history of which has been fully detailed — the symptoms described (§ 40.) as characterising this state were present, particularly the tormina, followed by desire of evacuation, and tenesmus, with the discharge of a little bloody mucus or water; the oblong tumour, in a part of the abdomen, admitting of being recognised at some period of the disease; have been superadded to the other symptoms of ileus, and pointed out its precise nature. In two cases I felt inclined to have had the operation performed; and, indeed, suggested it. The diagnosis was found correct on examination after death. A case is given by Dr. Fuschius, in Hufeland's *Journal* for February, 1825, almost identical with one of these, and characterised by the above diagnostic symptoms, in which he resorted to this operation over the place to which the patient referred the sensation of obstruction, and where an obscure oblong tumour, in the situation of the ascending colon, was detected. An invagination of the colon was removed, and the patient perfectly recovered. The reader need not be informed that ileus very commonly proceeds from strangulated hernia, and sometimes persists from adhesions, &c. after the displaced bowel has been returned. The propriety of having an early recourse to the operation after we fail in returning the protruded intestine is here very obvious.

85. *N. During, and subsequent to, convalescence* from ileus, the patient should wear flannel next tho skin, and promote the functions of the stomach and bowels by vegetable bitters combined with gentle aperients, and the sub-carbonates of the alkalies. The bulky and flatulent vegetables ought to be avoided, and the extremities and surface of the abdomen and loins kept equably warm. The utmost attention should be paid to diet; all

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[*] “Olim *Crisii* incidi in hunc morbum (volvulum) ego; Hungarus Sartor accitus me restituit intra tres horas methodo sequenti: impositum me supinum prato, inunctisve oleo olivarum manibus suis depsabat prout pistores pastam panis subtiliter incipiens successive semper fortius totum abdomen meum.” (p. 320.)

indigestible substances, and acid or acerb beverages, carefully avoided.

86. III. TREATMENT OF SYMPTOMATIC OR COMPLICATED COLIC. — *A.* The means of cure in most cases of this description should be directed to the diseased viscus, by which the functions of the alimentary canal are affected. *a.* Those colicky symptoms which are produced by irritation, or the passage of *gall-stones* through the common bile-duct, and by the obstruction occasioned by *concretions* in the intestines, will generally be relieved by nearly the same treatment as that recommended in this article; but whatever difference should exist, is detailed in the article on CONCRETIONS. *b.* The colic which is symptomatic of *worms* in the intestines requires, if the attack be severe, the internal and external means already recommended to allay the urgent symptoms; but after this is accomplished, the remedies resorted to for the cure of verminous disorders should be employed. (See art. WORMS.)

87. *B.* The occurrence of colic from *affections of the kidneys*, particularly from calculi in their pelvis or ureters, should not be overlooked by the practitioner; nor should he forget that it is sometimes consequent upon *aneurism of the abdominal aorta*, and of *tumours* formed *in the mesentery*, or in the omentum. *a.* In the first of these pathological states, much relief will be afforded by the alkaline sub-carbonates, with opiates or sedatives, and followed by oleaginous purgatives and enemata, in addition to whatever depletory or other measures the circumstances of the case will point out. The use of liniments with camphor, soap, and opium, rubbed on the abdomen and loins, will also give much relief. *b.* In colic depending upon the latter organic changes, little beyond palliating the urgent symptoms by the remedies now mentioned, can be expected.

88. *C. Flatulent* colic, generally of a prolonged description, and often not easily removed, at least in a permanent manner, sometimes occurs in the course of *asthma* and *bronchorrhœa*, owing apparently to the interrupted functions of the mucous surface of the lungs; the evolution of gaseous fluids, from the blood being impeded on this surface, but supervening vicariously on that of the alimentary canal. In such cases, after the bowels have been freely evacuated, carminatives combined with ipecacuanha and hyoscyamus; the infusion of valerian, with prussic acid, and spirit. anisi; powders of magnesia, oxide of bismuth or of zinc, and ipecacuanha; sulphate of zinc, with myrrh, camphor, and opium or hyoscyamus; and camphor mixture, with extract of belladonna, spiritus ætheris sulphur. comp. and spirit. menthæ; are among the means which will afford the greatest relief.

89. *D.* There are few more common complications than *hysteria* and *colic;* but the treatment varies not materially from that now stated. *a.* In such cases, the functions of the uterus require strict attention; for morbid sensibility, and even vascular excitement, both of this viscus and of the ovaria, are often present. The treatment too commonly adopted in this state of complication, although it may give immediate but temporary relief, not infrequently perpetuates the pathological state, of which both hysteria and colic are merely symptoms. Instead of employing medicines which excite both the digestive mucous surface and the generative organs, in these cases, cooling and soothing remedies are much more appropriate to them, such as those above enumerated (§ 87.); local depletions, nitrate of potash, sub-carbonate of soda, extract of hop, cooling aperients, vegetable tonics, exercise in the open air, &c. *b.* When the complaint is symptomatic of difficult menstruation (§ 43.), general or local blood-letting may be resorted to in the plethoric subject: but in the weak or hysterical, camphor, ammonia, soda, &c. with hyoscyamus; or the acetate of morphine or laudanum given in some aromatic spirit, the ammoniated tincture of guaiacum in linseed tea, the preparations of rue and of juniper, and the treatment detailed in the article on the *Disorders* of MENSTRUATION, will generally give speedy relief. *c.* Colicky pains sometimes occur during *pregnancy:* in such cases, cooling aperients, with antispasmodics and opiates or other anodynes, and preceded by sanguineous depletion, if congestion or plethora exist, will remove all disorder. *d.* Severe attacks of colic are not uncommon upon *suppression* of the *menses* or of the *lochia.* If a tendency to inflammatory action manifests itself, and especially if the patient be plethoric or robust, general or local depletion should be practised; a dose of a mixture composed of a decoction of the radix rubiæ, tincture and syrup of saffron, and as much borax as it will dissolve, should be given every two hours; the volatile liniment with camphor and opium ought to be rubbed on the abdomen; and, afterwards, a fomentation with the decoction of poppy-heads, &c. applied to the same situation. SCHMIDTMANN advises a cataplasm, consisting of marshmallows, henbane, bruised linseed, and poppy-heads, to be placed warm on the abdomen; and the steam of hot water to be conveyed to the pudenda. *e.* If colic proceed from *congestion* or *inflammatory irritation* of the *uterus* or *ovaria,* local depletions; diaphoretics, and refrigerants, combined with sedatives; aperients, with cooling emollient enemata, and low diet, are the most appropriate remedies.

90. *E.* Colicky complaints are not infrequently referrible to *congestion* and *irregular vascular action* in the *liver, pancreas,* or *spleen;* or, if not arising from such disorders, are associated with them, owing to deficient energy of the organic nervous system; and, consequently, to imperfect performance of the abdominal functions generally. *a.* In cases of this kind, local depletions, followed by purgatives, exerting a chologogue and deobstruent action, external irritation, and, subsequently, by vegetable tonics, laxatives, regular exercise, and a course of the Leamington, Harrogate, Buxton, or Cheltenham, mineral waters, or the artificial waters of Carlsbad, Spa, Ems, &c., according to the circumstances of the case, will generally remove all disorder. Impeded circulation through the portal system, is more or less concerned in the causation of colic pains in these cases; the return of blood through the mesenteric and hæmorrhoidal veins deranging the contractile actions of the intestines, and giving rise, in many cases, particularly those in which this pathological state obtains, to the additional association of hæmorrhoidal affections, which, if neglected, may terminate in anal fistulæ. *b.* It is not un-

common to find a severe attack of colic usher in *hæmorrhoidal discharges:* the impeded circulation through the portal vessels, and the consequent fits of colic, being both relieved by the consecutive hæmorrhage from the hæmorrhoidal veins and mucous surface of the rectum. In almost all such cases, in addition to the congestion and associated disorder of the assistant chylopoietic viscera, there are more or less vascular plethora, impeded secretion generally, and deficient energy of the organic nervous system, — a complicated state of disorder evidently requiring local depletions from the region of the liver, or, as Continental practitioners very reasonably prefer, from the vicinity of the anus, with the remedies above stated, and assisted by regular exercise, gentle tonics, aperients, and a regulated diet and regimen. From this it will not appear singular that very dangerous attacks of colic, or even of ileus, will sometimes occur after the operation for hæmorrhoids or anal fistulæ, or other morbid states of the rectum, when performed, as they sometimes are, without previous medical treatment of a kind appropriate to the state of internal disease. *c.* The complication of colic with either acute or chronic *jaundice* is evidently referrible, either to the passage of gall-stones (§ 86.), or to the pathological state of the liver now noticed, or to inflammatory action in the duodenum or biliary ducts, or, lastly, to congestion of bile in the hepatic ducts, or in the gall-bladder. When symptoms of local plethora or congestion can be detected, cupping, and the rest of the treatment now directed, will be serviceable. (See Jaundice — *Treatment of*.)

91. *F.* When the colic arises from atonic, misplaced, or erratic *gout*, large doses of the subcarbonates of the alkalies, or magnesia, with camphor or ammonia, are required, followed by bloodletting, if the pulse, habit of body, and strength of the patient admit of it; by calomel, with camphor and hyoscyamus, or opium, at bed-time; by active cathartics, conjoined with stimulants and restoratives, as long as the alvine evacuations indicate the propriety of their exhibition; by purgative and antispasmodic injections, and by rubefacients and sinapisms to the lower extremities. After morbid secretions and retained fæces are evacuated, colchicum may then be given with ammonia, or with camphor and magnesia. But *arthritic colic* occurs most frequently in aged persons, or in those with exhausted constitutions, in whom, instead of evacuations, beyond the expulsion of morbid secretions, active stimulants, — as large doses of camphor and ammonia, or of guaiacum and ammonia, — with warm spices, Cayenne pepper, and sometimes combined with opium or aconitum, and assisted by sinapisms, are indispensably requisite.

92. *G.* If colic supervene on the disappearance or suppression of *rheumatism* from the joints or aponeurosis, or the repulsion of *chronic eruptions*, local depletions, followed by camphorated liniments and fomentations; warm turpentine epithems applied on the abdomen; calomel, with antimonial preparations, or with ipecacuanha and opium; warm vapour and fumigating baths; the sub-carbonates of the alkalies, sulphur, the compound decoction of sarsaparilla, or the decoction of dulcamara; blisters, tartarised antimonial plasters or ointments, saponaceous and oleaginous enemata; and sinapisms to the extremities or parts primarily affected; constitute the chief means of cure. The frequency, and, in two of the forms of the disease especially, the danger, of the complaint now discussed have induced me to be more circumstantial in the account of its pathology and treatment than may appear requisite to many: but I am convinced that the experienced practitioner will not be of the number; but will find cause to regret, with myself, upon reviewing his knowledge, that his information on the subject is not greater than his means of observation have yet afforded him, or my labours can possibly assist him in obtaining.

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Those who wish to be acquainted more fully with the opinions of the writers of the fifteenth, sixteenth, and seventeenth centuries, as to *Ileus* and *Colic*, will find them detailed at considerable length in Bonet's *Polyalthes*, &c. fol. vol. i. p. 500. *et seq.*; in his *Mercurius*, fol. p. 115.; and in Manget's *Bibliotheca Medico Practica*, fol. vol. i. p. 575. Although I have not availed myself of these collections in any way, owing to my circumscribed limits, and desire to give more precise information of a later date, and more in accordance with my experience, than that which they furnish, yet will they be found to contain much of what has been considered of much more modern date, and, when sifted from the refuse, of no mean value.

The *Bibliography* of these diseases, in Ploucquet's *Med. Digesta*, is brought down to the commencement of this century; but many of the references are inaccurate: that by Young is very scanty, and not select. The list appended to the art. *Ileus*, in the great French Dictionary, is entirely a catalogue of *Theses* on the subject, of no value; instead of consisting, as it ought, of references to the experience of the best practical writers.

COLON.—Syn. Κωλον. *Der Grimmdarm*, Ger. *The Large Bowel.*

1. The colon is very often the seat of disease, the rest of the alimentary canal being but lighstly affected. In some complaints, as *constipation*, *colic*, and *dysentery*, it is the part principally disordered; and in others, as *indigestion*, *diarrhœa*, *ileus*, *peritonitis*, &c., it participates in the disease with the rest of the digestive organs. The investigation, therefore, of these maladies necessarily includes the consideration of the chief morbid states of this viscus. But there are other derangements which require a brief notice at this place, and which do not belong to these diseases, or to those changes of structure that are common to it and the rest of the alimentary canal, and which will be considered in the article on the *Pathology of the* Digestive Canal.

Torpor or Atony of the Colon, and its Consequences. — Classif. — I. Class, I. Order (*Author*).

2. Defin. *General debility, with indigestion; slow or irregular state of the bowels; distension, borborygmi, or stridulous noises, in the course of the colon; frequently pain or uneasiness, sometimes with tumours in some part of this viscus.*

3. i. Its Pathology. — Atony and distension of the colon may be variously associated with other disorders. They obtain more or less in all cases of constipation and colic which depend not upon inflammation, or upon diminution or constriction of the canal of the intestines; and they are also often complicated with torpor of the liver, and deficient secretion from the internal surface of the colon. Distension is usually occasioned by flatus or fæcal matters; and it may produce little or no inconvenience, beyond constipation, until it reaches a great extent; but it frequently gives rise to *flatulent* and *stercoraceous colic*, and even to *ileus*. The gases found in the colon are azote, carbonic acid gas, and carburetted hydrogen, in varying proportions; and, when they accumulate largely, they always produce borborygmi or an unpleasant or painful sense of distension, and constipation or colic. *A. Flatulent distension of the colon* (see Flatulence) is commonly dependent upon want of vital tone of the digestive organs generally, and of this viscus particularly. In irritation or inflammation of the bowels, flatus is also generated in great quantity; but it is usually expelled quickly, especially when they are unobstructed, owing to reaction of their muscular coats. Much doubt exists as to the source whence this flatus proceeds. The circumstance of its rapid reproduction after its evacuation, when the bowels contain no substances which could give rise to it, and various physiological considerations, lead me to infer that it is in great measure exhaled from the digestive mucous surface; the gases consisting chiefly of those which pass into, or are formed by, the blood; and, in health, are afterwards given out from it, on the mucous surface of the lungs. Persons who often expel the flatus from the lower bowels, where it evidently is destined to perform useful purposes

in the economy, are most subject to an atonic state of the colon, and to a continued as well as an increased generation of the intestinal gases: and, when circumstances prevent the accustomed frequency of their discharge, are most liable to experience the effects of their accumulation. Atonic distension of the colon by flatus is also a common attendant upon congestion of some one or more of the abdominal viscera, and even upon general vascular plethora, particularly when it oppresses the circulating energies. It also often accompanies hysteria: and, owing to the increased sensibility of the organic nerves, as well as to the morbid irritability and irregular action of the muscular fibres of the bowels, gives rise to various painful sensations in their course, and to anomalous states of disorder.

4. *B.* When *an atonic and flatulent state* of the colon is associated *with morbid irritability* of the muscular coat, painful sensations in some part of the course of this viscus are frequently complained of, particularly by females; are by them often referred to its left arch and descending portion; and are attended by loud croaking or stridulous noises, especially upon full respiration and mental emotion. The bowels are usually constipated, and attempts at evacuation are accompanied with slight tenesmus, the stools being discoloured, hard, slimy, or in lumps. The abdomen is tumid; and tenderness, often shifting its place, and varying in degree or duration, is sometimes felt. The whole digestive organs necessarily participate in this state of disorder, and perform their functions imperfectly. The nervous system of organic life acquires increased sensibility; the cerebro-spinal system becomes morbidly susceptible of impressions, particularly in females; the countenance is pale, slightly discoloured, and often covered by an oily moisture; the tongue is loaded, flabby, sometimes large, presenting fissures on its surface, and the impressions of the teeth on its edges; the pulse is weak and soft; and a sense of distension and oppression follows a full meal. This state of disorder is very frequent in young females, who take not sufficient exercise; and, when neglected, is often the forerunner of more serious ailments, both of the bowels and of the generative organs.

5. *C.* Deficient vital energy of the colon also gives rise to *relaxation or irregular action* of its coats, to constipation, and to collections of fœcal matters, generally with more or less flatulence. *Fæcal accumulations* to a great amount is most commonly met with in aged females, or persons far advanced in life, who have injured the tone of the bowel by the frequent use of cathartics, and have passed a sedentary and luxurious existence. They also occur, but to a much less extent, in children and young persons, especially females from the ninth to the eighteenth year of age, and even upwards. Sometimes they occasion large tumours, particularly in the cæcum and sigmoid flexure, but occasionally also in the transverse arch and other parts of the colon. When distension proceeds from retained fæcal matters, in addition to the local signs observed on careful examination and percussion of the abdomen in the course of this bowel, numerous symptomatic ailments are complained of. These vary but little from those described above (§ 4.), and in the article treating of accumulations in the Cæcum (§ 11.). The countenance and skin are generally foul, unhealthy, and devoid of animation; the perspiration is thick, clammy, fœtid, and oleaginous; the breath very offensive; the tongue loaded or furred; the lips and gums are pale; muscular energy is much diminished; the appetite imperfect or capricious; digestion difficult; headach or vertigo is often present; the abdomen is tumid, doughy, and inelastic; the urine is loaded; the bowels are either constipated or irregular, or, if daily evacuations take place, the motions are slimy, very dark or otherwise discoloured, scanty, and offensive; and the pulse soft, weak, often slow, but afterwards accelerated. In many cases, pains in the loins, abdomen, and limbs, are complained of, with mental inactivity, general lassitude, œdema of the lower extremities, flabby inelastic state of the soft solids, leipothymia, or fainting, upon quickly assuming the erect posture, and occasional fits of sinking, especially in females.

6. Although torpor of the colon is most frequently followed by fæcal accumulations and distension, yet these are neither constant nor necessary results of this state, at least to any very manifest extent; for sordes and fæcal collections may be very injurious to the mucous surface, without proving so from their bulk or mechanical effects only. Indeed, they are often noxious from their acrimony, without occasioning remarkable distension, or any degree of obstruction, particularly when the vital energies are depressed. Their presence, therefore, should be inferred rather from various remote symptoms, than from those which are referrible to the colon itself. But, whenever disorder of remote organs leads us to suspect torpor of this bowel, the practitioner should make an accurate examination of all the abdominal regions, commencing with that of the cæcum, following the course of the colon, between the ilium and right ribs, below the epigastrium, and under both hypochondria, to the left side and iliac fossa, and to the hypogastrium. If a sensation of doughy fulness be felt by the examiner, in any part of its course, the internal surface of the bowel is probably lined with sordes and accumulated secretions, which its vital energy has not been sufficient to throw off. If hardness be felt, with more or less tumour, fæcal collections are most likely formed. But the evidence furnished by this examination should not satisfy us: we should enquire after the symptoms stated above, particularly the foul or clammy tongue, fœtor of the breath, unnatural state of the countenance and cutaneous surface, and the offensive and morbid evacuations usually attendant upon this ailment. A belief is too generally entertained, that fæcal matters and sordes will not accumulate in the colon, unless the patient has been constipated. But they may collect in its cells, the more central part of the canal allowing daily evacuations; and they may even remain there for a considerable period, producing much irritation, and even a relaxed state of the bowels; thereby misleading the judgment of the practitioner as to the pathological state constituting the disorder. How, therefore, is he to form an accurate opinion? By a careful examination of the abdomen in the course of the colon, of the urine, of the stools, and of all the organic and animal functions, and by ascertaining the pre-

sence of the symptoms enumerated above (§ 4, 5.). In many cases, when the morbid collections have become acrimonious, an irritative diarrhœa continues for some time, or recurs at intervals, before the morbid matters are fully thrown off, owing to spasmodic constrictions of parts of the bowel. On these occasions the stools are watery or fluid, and are apparently composed of discoloured fæces, broken down and mixed in a liquid; at other times they are dark green, muddy, putrid, &c.; very frequently they are slimy, containing lumps of hardened fæces, very offensive, and of a dark green or brownish black hue; and their evacuation is preceded by griping, tenesmus, or a scalding sensation at the anus.

7. *D.* Imperfect action of the colon is evidently dependent upon deficient vital energy of the frame, owing either to original conformation, or to various causes of exhaustion, acting chiefly on the digestive canal and associated viscera, with more or less torpor of the biliary functions. When allowed to continue, it perpetuates and augments the morbid condition in which itself originated; drawing other organs within the sphere of disease, particularly those of mental manifestation, and of generative function, in the female. In young persons it often occasions, or is *complicated with*, curvatures of the spine, chorea, chlorosis, retention or suppression of the menses, nervous tremors and convulsions, &c., and when the distension of the colon is great, dyspnœa or shortness of breathing, palpitations of the heart, &c.; these affections appearing oftener, perhaps, along with it, as associated effects of depressed vital power, than as consequences of this particular lesion of function.

8. *E.* The more *remote causes* of torpor and distension of the colon are, confinement in close and crowded apartments during the greater part of the day, and sleeping in chambers similarly circumstanced; constrained and sedentary positions, in which the abdominal muscles remain nearly inactive; premature and excessive cultivation of the mental, to the neglect of the physical, powers, — the discipline of modern boarding schools; the inappropriate combination and use of purgative medicines; indolent and luxurious habits; occupations which prevent bodily activity, and particularly those performed by the assistance of machinery, and in hot foul air stagnant in crowded manufactories; pre-existing debility of the stomach and digestive canal, or of the frame generally; paraplegia or hemiplegia; disease of the spinal column, its membranes, or chord; neglect of the first intimation to alvine evacuations; venereal excesses; the disgusting habit of expelling the flatus from the bowels; and by whatever weakens, either directly or indirectly, the vital manifestations of the alimentary canal, or disorders the general health.

9. *Local and constitutional effects produced by torpor of the colon.* — *A.* Owing to the course and connections of the colon, to the remote causes above enumerated, and to the depression of digestive and vital energy they occasion, the matters discharged into this bowel from the small intestines, and the secretions from its own internal surface, are liable to be retained for a long time. Fæcal accumulations and obstruction have been now shown necessarily to follow such retention. It may be *next* requisite to point out certain of the most important and frequent consequences of these states: — *a.* One of the most immediate is the retention of the mucous secretion within the follicular glands, as well as in the ducts leading from them; causing distension, and subsequently inflammation and ulceration of them. *b.* The retention of fæcal matters in the colon is often followed by absorption of much that otherwise would have been excrementitious, both into the general current of the circulation, and, at first, at least, into the blood which flows into the portal veins, where it often excites and irritates the liver, and either is partially removed by this viscus, giving rise to increased or vitiated biliary secretion, or contaminates the whole circulating and secreted fluids. *c.* The bile also may, particularly in warm countries, and in persons in whom it is habitually secreted in excessive quantity, be rapidly conveyed along the small intestines with the chyme, and yet be retained too long in the cæcum and colon, whence it may be absorbed, with a portion of excrementitious matters, into the circulation, and give a lurid or unhealthy aspect to the countenance, and occasion various constitutional ailments, characterised chiefly by lassitude, debility, irregular action of the bowels, loaded urine, and a foul tongue. *d.* Fæcal accumulations, when allowed to remain too long in the colon, and thereby to give rise to gaseous and noxious formations, not only impede many of its functions, but also favour changes in the vascular action and structure of its coats, particularly of its mucous, sub-mucous, and muscular tunics, — the first and second becoming irritated, inflamed, or even ulcerated; the third over distended, and thereby deprived of its power of salutary reaction. *e.* Among the most common consequences, also, of torpor and fæcal infarction of the colon, are hæmorrhage from it and the rectum, and hæmorrhoidal tumours, arising immediately from the foregoing changes, and from interrupted circulation through the hæmorrhoidal veins.

10. *B.* The effects of over-distension of the colon upon the other abdominal viscera, owing to the extensive connections subsisting between them and this bowel, may be readily inferred. *a.* The distended cæcum and sigmoid flexure of the colon press injuriously upon the femoral nerves and blood-vessels, the ureters, and the internal iliac veins; producing numbness, cramps, pains, and, owing to the impeded return of blood, more or less œdema, of the lower extremities. The ascending and descending portions of the colon press upon the kidneys and adjoining vessels, occasioning disorder of the urinary secretion, with a sense of weight, or dull aching pain in the loins. Distension of the right and left flexures, and transverse arch, deranges the functions of the biliary organs, the duodenum, stomach, and spleen. *b.* If the colon be distended to the utmost, not only are all these consecutive disorders much increased, but the descent of the diaphragm is also much impeded, and the actions of the heart and lungs materially affected; occasioning palpitations, intermissions, and irregularity of the pulse, dyspnœa, and a short and rapid respiration. Owing to this effect upon the circulating and respiratory organs, the return of the blood from the head is retarded, various nervous ailments, and headach, are occasioned; and determination of blood to, and con-

gestions and effusions of serum on, the brain and its membranes, supervene as the more remote effects. *c*. Fæcal or flatulent accumulations in the colon affect, in a very evident manner, the functions of the small intestines and stomach, or increase disorder in these viscera, when it previously exists, — a circumstance of frequent occurrence, the function of digestion being equally impeded with that of defæcation, and owing to the same primary pathological state, namely, imperfect manifestation of vital power throughout the organic nervous system. Hence the indigestion, the acrid and flatulent eructations, and the imperfect chylifaction and nutrition, so frequently associated with torpid function of the large bowels. *d*. In children and young persons, the mucous sordes, morbid secretions, and excrementitious matters, that collect as a consequence of this state, become not only a nidus for worms — remarkably favouring their generation; but also a cause of irritation to the mucous surface, to the absorbing vessels, and to the mesenteric glands, owing to their partial absorption, either alone, or with whatever chyle may be formed. That diseases of the intestinal mucous surface, and that obstruction and enlargement of these glands, with the consequent *marasmus*, &c., often arise from the morbid impression and irritation caused by these retained excretions, an extensive experience in the diseases of children has fully convinced me; and that dysentery and diarrhœa, among this class of patients, as well as in adults, frequently proceed from this cause, more especially in warm and unhealthy climates, will be acknowledged by every experienced practitioner. *e*. Even many of the diseases that affect the skin, and chronic ulcers of the lower extremities, arise from the absorption from the large bowels of excrementitious matters, that irritate and inflame, in the course of their elimination from the blood by the cutaneous function, the delicate vascular tissue subjacent to the cuticle. This is particularly the case in warm countries and seasons, in which the quantity of these matters always passing out of the circulation by the skin is much greater than is usually supposed. Whatever opinion may be formed as to the origin of such affections, there can be no doubt that the treatment based upon this doctrine is the most successful in removing them. *f*. Among other consequences of fæcal accumulations in the colon, elongations and displacements of this bowel may be ranked; and, when these changes take place, they increase the disorder which occasioned them. It has often been remarked, particularly by ESQUIROL, HINZE, and others, that displacement of the colon is one of the most common morbid appearances found in the bodies of hypochondriacal and melancholic persons. Torpor or atony of this viscus favouring fæcal accumulations in it, is an important characteristic of these affections, and is manifestly connected with the causation of displacement of the large bowel. (See art. HYPOCHONDRIASIS, &c.)

11. ii. TREATMENT. — The indications of cure in cases of torpid function of the colon, consist — 1st, of evacuating whatever fæcal or acrimonious matters may have collected in it; and, 2d, of restoring the energy of the digestive organs, and directing such regimen as may prevent a return of this disorder. *A*. Many practitioners, deceived by the reports of the patient, or misled by the appearances of the stools procured by the first purgatives prescribed, stop far short of the point to which these medicines should be carried. It is not sufficient to order two or three doses of purgatives, or even of active cathartics; but they ought to be repeated, or continued so as to secure their full effect, and be combined with such other medicines as will promote their opertion without weakening the parts which they stimulate, and will prevent the patient from being debilitated by them. In all affections of the colon, purgatives that procure full, bulky, and not frequent or watery evacuations, should be selected. The preparations of aloes (F. 181. 454.), those of senna combined with gentian (F. 266. 430.), castor oil, rhubarb and magnesia, precipitated sulphur (F. 45. 82. 96.), the compound jalap powder, &c. (F. 635, 636. 652.) operate in this manner; and, particularly when we wish to promote the secretions from the intestinal surface, may be exhibited after a dose of calomel or blue pill taken at bed-time; or the compound extract of colocynth, or the aloes and myrrh pill, or jalap, may be combined with one of these mercurial preparations, and the extract of hyoscyamus (see F. 462. 471. 881.). When it is necessary to continue the exhibition of purgatives, they should be either alternated with tonics, or combined with vegetable bitters, which will both promote their action, and increase the strength of the patient (see F. 562. 572.). When the motions are morbid, great advantage will be derived from resorting to the use of clysmata, as recommended in the article COLIC (§ 57. 66. 77.). If fæcal collections to a great extent have formed, they are indispensable remedies; and if symptoms of obstruction, or of irritation, or chronic inflammation, are manifest, they should be assisted by the external means there advised (§ 66. 83.). Under every circumstance, the exhibition of purgatives by the mouth, and of enemata, should be persisted in until the stools assume a natural appearance. (See also the *Treatment* of diseases of the CÆCUM, and of CONSTIPATION).

12. In cases where retained matters in the colon have occasioned irritation, such clysters as will promote the full evacuation of its contents, and at the same time allay irritation, ought to be resorted to from time to time. These will relax irregular constrictions of the bowel, promote the operation of purgatives given by the mouth, dissolve hardened fæces, and loosen the adhesion of tenacious secretions lodged in its cells. In cases of this description, the soap injection, with, or without, the addition of castor or olive oil, the compound decoction of barley with common salt, or the soda tartarizata; the infusum lini, with the sub-borate, or the sub-carbonate of soda and assafœtida; the decoction of marsh-mallows, with the infusion of camomile flowers and linseed oil; and the turpentines triturated with white of egg or mucilage; will have a most beneficial effect, particularly when assisted by appropriate laxatives taken by the mouth. When the irritation of the bowel appears to be accompanied by spasmodic constriction, the aperients should be combined with either camphor, ammonia, ipecacuanha, hyoscyamus, the compound galbanum pill, &c. (F. 463. 890.), according to existing cir-

cumstances. In cases of this kind, much debility is often present, and the functions of the stomach require the aid of light nutritious food and gentle tonics; the purgatives being exhibited either at bed-time, or early in the morning, so as not to disorder the functions of the stomach. Such eccoprotic or alterative laxatives as are slow in their operation (F. 503. 892.) should be taken at night, and purgatives or cathartics that are quick in their action early in the morning, so that they may not interfere either with necessary food or with requisite avocations.

13. When the fæcal accumulations cannot be removed by the above means, others of a more powerful nature, as the elaterium or croton oil, assisted by colocynth or terebinthinate injections; and the purgatives advised in the more obstinate cases of *colic* and *constipation*, assisted by shocks of electricity and galvanism passed through the abdomen; should be resorted to. When the bowels are acted upon with great difficulty, the stools being very black and offensive, we may generally infer that not only is the colon torpid, but the follicles are loaded or obstructed, and their secretion morbid. In these cases, galvanism, as shown in an instructive case by Mr. Clarkson, promises to be of much service. In several instances, when the pulse has been weak, and the skin cool, I have added the extract of nux vomica to the purgative with much advantage, and combined a portion of this active substance with the liniment (F. 306.) which has been rubbed on the abdomen.

14. *B.* In order to prevent the re-accumulation of morbid matters in the colon, and give tone to the digestive organs generally, the patient should daily attend to the first intimations of evacuation, and promote the functions of digestion and defæcation, by resorting, whenever they flag, to aperients or laxatives, combined with tonics. Blue pill, with the aloes or myrrh pill, or F. 470., may be occasionally taken at night, and the tonic and aperient medicine (F. 266.) the following morning. The diet and regimen should be carefully regulated, and exercise be taken in the open air, either on foot or horseback. After health has been in a great measure restored, chalybeate mineral waters, and the artificial waters of Ems and Pyrmont, will be productive of much benefit; but frequently it will be more advantageous to commence with the Harrogate or Leamington waters, or with the artificial waters of Seidschutz, Eger, or Carlsbad, and have recourse subsequently to the chalybeates of Cheltenham or Tunbridge. In many cases, the warm or tepid salt water douche over the abdomen, sea-bathing, frictions of the surface of the body, and of the belly especially, night and morning, with either a hard towel or brush, will prove of much service.

15. II. Unnatural Positions of the Colon, &c. — This viscus is not infrequently found misplaced, and forming singular flexures, in those who have suffered from constipation, fæcal retention, dysentery, hypochondriasis, or melancholia. But there are no constant symptoms by which such changes can be inferred with much certainty during the life of the patient. M. Esquirol found, out of 168 dissections of melancholic patients, the colon displaced in 33. This change had previously been remarked by Morgagni (*De Sed. et Caus. Morb.* epist. iv. art. 16. *et seq.*), Haller (*Elem. Physiol.* l. xxiv. sec. 13. *et seq.*), Soemmerring (*De Corp. Hum. Fabrica*, t. iv. p. 313.), and Wells, but unconnected with mental disorder. In many cases, the bowel is not only displaced, but is also elongated, without being divided, as in its natural state, into cells by partial partitions, and the tonic action of its longitudinal bands. These changes seem to be favoured by relaxation of the mesocolon, and by complete atony of those bands. An elongated and displaced state of the colon is common in cases of old hernia; and in these is often connected with a stretched appearance of the mesentery, but without any organic change of the coats of the bowel: but sometimes the unnatural flexure or duplicature is adherent at its opposite sides, forming a large loop, particularly when it has been consecutive of acute or inflammatory dysentery. Displacement may take place in any part of the bowel, but it is most common in the transverse arch and sigmoid flexure; the former part hanging down towards the pubis, generally in an unadhering, but occasionally in an adhering, loop; and the latter part crossing over to the right side of the abdomen, or passing behind the pubis. Duplicatures of the colon may also form at the right or left parts of its arch; the opposite peritoneal surfaces being more frequently, in such cases, adherent to a considerable extent by coagulable lymph. Several plates are given by Mr. Annesley illustrative of this change; which is not infrequently observed in fatal cases of chronic dysentery, particularly in warm climates. That these unnatural flexures are also often caused by fæcal collections, and by obstructions to the fæcal discharges situated either in the rectum or in the sigmoid flexure of the colon, appears very probable; but they may also arise from a naturally elongated formation of the bowel. That, when once produced, they favour such collections, with their consequences, particularly severe dyspeptic and hypochondriacal ailments, dysentery, severe colic, or even ileus, and great distension or inflammation of the colon or small intestines, cannot be doubted; but that they will occasion insanity or melancholy, as Esquirol and Hinze suppose, seems not to be made out. Dr. Yelloly states that Mr. Lawrence and Mr. Dalrymple, who have examined many bodies of insane persons, have very seldom observed in them any deviation from the natural course of the colon.

16. As we have no certain or even probable means of ascertaining the existence of these changes during life, it is unnecessary to offer any remarks on their *treatment*. But this is a matter of but little importance, as the disorders which they produce are in all respects the same as those already noticed; and even if their nature were recognised, they can be remedied or alleviated only by the means described above, particularly by laxative and solvent enemata; and by whatever will, whether taken by the mouth, or injected *per anum*, preserve a fluid state of the stools, or reduce them to a softened condition, and promote the healthy secretions and regular functions of the large bowels, and of the digestive organs in general. (See F. 82. 98. 144.) — (See art. Digestive Canal, for the organic lesions of the colon; and arts. Diarrhœa, Dysentery, and Intestines, for its other diseases.)

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Nat. l. iv. cap. 35. (*Greatly distended, &c.*) — *Adolphi*, De Intestino Colo, mult. Morbor. Nido, &c. Lipsiæ, 1718. — *Vater*, De Situ Natur. et Præternaturali Intest. Coli. Witeb. 1737. — *Fischer*, De Morbis Intest. Coli, &c. Erf. 1728. — *Hamberger*, Observat. Clinic. Jenæ, 1754, p. 10. (*Great distension.*) — *Stoerck*, Annus Med. t. i. p. 126., et t. ii. p. 268. (*Flatulent and fæcal distension, and laceration of the longitudinal bands.*) — *Leusingk*, De Morbis a Situ Intestin. Crassor. pendentibus. Goet. 1756. — *Van Royen*, De Intest. Crassis, multorum Morb. Causa et Sede. Lugd. Bat. 1752, 8vo. — *White*, Cases in Surgery, p. 13. — *Hamilton*, On the Utility of Purgative Medicines, 8th ed. 8vo. 1826. — *Abernethy*, On the Constitutional Origin of Local Diseases, 8vo. — *Roth*, Patholog. Intest. Coli. Erlang. 1802. — *Wells*, in Transac. of Society for promoting Med. and Chirurg. Knowledge, vol. iii. p. 158. — *Esquirol*, in Diction. des Sciences Méd. t. xxxii. p. 172.; et Journ. Génér. de Méd. Fran. et Etrang. Mai et Juin, 1818. — *Geoghegan*, Transac. of the College of Physicians of Dublin, vol. i. p. 194. (*Great distension of the colon.*) — *Stoker*, in Ibid. vol. ii. p. 6. (*Rupture from distension, without ulceration.*) — *Hinze*, Archives Génér. de Méd. t. iii. p. 125. (*Displacement of colon.*) — *Yelloly*, in Edin. Med. and Surg. Journ. vol. xvi. p. 476. (*Displacement of colon.*) — *Clarkson*, in Ibid. p. 475. — *Annesley* and *Author*, Researches on the Diseases of India, &c. vol. ii. p. 50. *et seq.*

COMA. — Syn. and Deriv. Κῶμα, *Profound Sleep* (from Κω, I lie down). *Carus*, Sauvages; Good. *Cataphora*, J. Frank. *Lethargie*, *Assoupissement*, Fr. *die Schlafsucht*, *Schlaffieber*, Ger. *Sopore*, *Somnolenza*, Ital.

Classif. 2. *Class*, Nervous Diseases; and 1. *Order* of this Class (*Cullen*). 4. *Class*, 4. *Order* (*Good*). IV. Class, III. Order (*Author*, in *Preface*).

1. Defin. *Preternatural sleep, with physical torpitude, and suppression of the mental powers.*

2. I. Varieties and Symptoms. — There are various modifications of coma, each of which have received different appellations, as *Lethargus*, *Cataphora*, *Agrypnia*, *Carus*, &c.; these names being also used generically by some authors, but more frequently specifically, as I shall apply them on this occasion. They are all most commonly symptomatic of pre-existing disease; but they are also occasionally primary affections. I shall, therefore, after describing very succinctly each variety of coma, and its more constant symptoms, notice it first as a primary affection, and next as an important phenomenon in other acute diseases, particularly of their severe forms or advanced stages: afterwards the different pathological states causing this affection, the signs which distinguish them, and, lastly, the means best adapted to relieve them, will be briefly stated.

3. i. Coma Vigil — *Agrypnia*, Κῶμα ἀγρυπνῶδες (Hippocrates), Typhomania, *Sopor cum Agrypnia* — is *characterised* by a constant disposition to sleep, without falling into quiet, sound, or natural sleep; by low muttering delirium, or unconnected talk; unnatural action of the hands and fingers, sometimes also of the feet; pale sunk countenance; a natural or but slightly increased temperature of the head; by the patient opening the eyes and staring about upon the slightest disturbance, or starting up as if frightened by strange sights, and again attempting to lie down; and sometimes by difficulty of speech and of swallowing liquids.

4. ii. Lethargy — *Lethargus*[*] (from λήθη, Lethe, et ἀργος, celer), *Veternus*, Lat. — is *characterised* by slight but constant somnolency, or mental and corporeal torpor, evidently depending upon a morbid condition of the brain; when addressed, the patient answers forgetfully, and afterwards sinks into the same state as before. This is a slighter grade of the following varieties, and may pass into them.

5. iii. Coma Somnalentum — *Cataphora* — is *characterised* by sopor or profound sleep, without the power of wakening spontaneously; the patient, when roused, slowly opening the eyelids, and answering either rationally, forgetfully, or incoherently, but immediately afterwards falling into the same state of profound sopor; and frequently by relaxation of the muscles of the lower jaw, it thereby differing from apoplexy and carus.

6. iv. *Coma profundum* — *Carus*, Κάρος — is *characterised* by its more or less sudden invasion; by the profound sopor, the eyes being shut as in a deep sleep, and the patient being generally deprived of motion and sensation. Sometimes, however, upon being called to loudly, he opens his eyes, but immediately shuts them, without answering any question; and occasionally when pinched he draws away the part, indicating remaining sensibility; the breathing is undisturbed or irregular, sometimes laboured, but without stertor: there is seldom much febrile heat, and the evacuations are passed without consciousness.

7. *A. Review of the chief symptoms.* — *a.* The *pulse* varies greatly in each of the above states of coma. It is generally slow, full, and soft; but it is also often small and quick in coma vigil, or in any of the varieties, when accompanying the last stages of fever; and small, hard, and sometimes irregular, in the coma attendant upon inflammatory action of the brain or its membranes. It is also frequently unequal, intermittent, and generally slow, but sometimes also quick, in the coma produced by injury of the brain, and by hæmorrhage or effusion of fluid within it. *b.* The *respiration* is often natural, as in coma vigil; sometimes accompanied by sighs, or laboured, as in coma profundum; frequently slow, and very seldom stertorous, unless in the coma of apoplexy. *c.* The *pupils* of the eyes are generally more or less dilated, and sluggish in their motions, or altogether insensible to light; but they are sometimes, in the most unfavourable cases, much contracted, or one contracted and the other dilated. *d.* The *countenance* is usually tumid, and without expression; sometimes pale or bloated, or red or injected; the eyes are prominent or suffused, and the head somewhat warmer than natural, or of the healthy temperature, the beat of the carotids being full or strong: in the coma consequent upon fever, and in coma vigil, the features are commonly pale, sunk, and cool; the action of the carotids being weak and soft in some cases, and hard and oppressed in others. *e.* The *mental powers* are commonly suppressed; but upon being momentarily excited, they sometimes appear more or less disordered, particularly in any of the states of coma supervening upon fever, or inflammation of the brain or its membranes; low delirium and febrile heat then being also present. *f.* The *surface* of the body is often natural, sometimes cold or clammy; but when the affection is caused by fever or inflammation,

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[*] I have, conformably with the received acceptation of lethargy in this country, made it the slightest form of soporose coma; although the ancients, our countryman Willis who has written ably on this affection, the greater number of writers of the sixteenth and seventeenth centuries, and many modern German authors, have defined it nearly as follows: — "profound sopor, or preternatural sleep, with fever and delirium;" thus applying the term to the more profound state of febrile coma.

the temperature may be somewhat elevated, and the skin dry. *g.* The *extremities* are frequently natural at first, but they are also often cold or clammy, or become so. *h.* The *position* is commonly supine, without attempts at motion, in profound coma; and, in the worst cases, the patient slips down in bed. *i.* The *tongue* is natural, or merely much loaded, in some instances; but in coma symptomatic of inflammation or fever, it is usually furred, dry, and brown, hard, and constricted. *k.* The *alvine excretions* are either retained, or passed without consciousness.

8. *B. Duration and termination.* — *a.* Any one of the forms of coma may be sudden in its *attack*, and terminate speedily in death; or it may come on gradually, and be of short duration, sense and voluntary motion as slowly returning. The seizure may be repeated frequently, or it may be periodic, particularly when attendant upon epilepsy, or remittent fever of a bad form. When its accession is slow, it often commences with drowsiness or headach. *b.* Its *duration* is very various; the lethargic and slighter varieties being occasionally of long continuance — sometimes lasting many weeks, and spontaneously passing off; the more profound states of coma frequently terminating fatally in a few hours, and seldom continuing longer than a very few days. *c.* It may *terminate* in either recovery or death, or in some other disease with which it is more or less closely related, as apoplexy, paralysis, insanity, or melancholia, epilepsy, and epileptic or other forms of convulsions with which it occasionally alternates; and in inflammation of the brain or its membranes.

9. *C. Diagnostic remarks.* — The states or grades of disease described above may pass one into the other, or into some other malady, whether they appear primarily or consecutively. They are often very nearly allied to, or rather are less degrees of, APOPLEXY; and apparently consist of a somewhat similar condition of the organic nervous power and vascular action within the brain, to that which obtains in a great proportion of the attacks of that disease (§ 62. *et seq.*), particularly those which do not immediately depend upon hæmorrhage. *a.* The close resemblance of many cases of coma vigil to *ecstasy*, and of the other states of coma to *catalepsy*, not only as to the grouping of the sensible phenomena which respectively constitute them, but also as to their presumed proximate causes, indicate that *catalepsy* and *cataleptic ecstasy* are merely unusual modifications of the state of cerebral disease now under consideration. *b.* The absence of stertor constitutes the chief difference between the most profound state of coma, carus, and *apoplexy*. *c.* The fulness and strength of the pulse, particularly in the carotids, and the natural or strong state of the respiration, are sufficient to distinguish coma from *syncope*, in which latter the action of the heart is greatly diminished primarily, the functions of the brain failing consecutively. *d.* Coma differs from *asphyxy* in the circumstance of the respiratory functions being first suppressed, and subsequently the action of the heart in the latter; the consequent coma arising from congestion of venous blood in the brain, produced by the abolished respiration, and obstructed circulation through the lungs and cavities of the heart.

10. II. Of Primary or Idiopathic Coma. — Either of the varieties described above may occur as a primary affection arising from states of the organic nervous power and circulation within the brain, which will be noticed in the sequel (§ 13.), and which are commonly produced by the following agents: — *Causes.* — The continued or intense action of cold upon the nervous system and circulation; the influence of narcotics, particularly in some constitutions; indulgence in spirituous or intoxicating liquors, either carried too far or continued too long; venereal excesses; insolation; fatigue or prolonged watching; the influence of particular odours, condiments, or kinds of food, in some temperaments; inanition or exhaustion of vital power, by whatever cause, especially in the aged of the male sex; immoderate evacuations or discharges; mephitic or carbonaceous fumes or gases; sadness, anxiety, fright, terror, anger, and other violent mental affections; the inappropriate use of either warm or cold baths; the exhaustion of vital or nervous power by excessive or long continued pain; concussions and injuries of the brain; erratic, atonic, or retrocedent gout; pregnancy or child-bearing; and suppression of the menses or lochia; are the causes which produce, in a primary form, any of the states of coma described above.

11. III. Symptomatic Coma. — Either of the varieties of coma may supervene in the advanced course, more rarely on the invasion, of intermittent, remittent, or continued fevers, particularly typhus; of inflammations of the brain and its membranes; and of insanity and melancholia. Simple determinations of blood to, or congestion of, the encephalon will frequently be sufficient to induce the slighter states of coma; whilst its more severe or profound conditions are common consequences of effusions of blood or serum, and of numerous organic changes occurring within the head. (See Brain — *Organic Lesions of its Membranes and Substance*, § 21—84.). It is one of the most important symptoms that appear in the course of erysipelas of the face or head, and of exanthematous fevers; it may likewise supervene, particularly *coma vigil*, in the advanced stages of several acute maladies evincing exhaustion of the vital energy of the brain and nervous system, and in those in which the circulating fluid and secretions become vitiated or contaminated. The coma which is usually consecutive of epileptic or convulsive attacks consists of the slighter varieties denominated lethargic and somnolent, forming a part or consequence of these diseases. Coma is sometimes, also, a symptom of severe hysteria, particularly in plethoric persons with interrupted catamenial discharge; and, in rare instances, of worms, but by no means so frequently as stated by some writers. The occasional occurrence of any of the varieties of coma from suppression or retention of urine, from metastasis of gout and rheumatism, from the suppression of accustomed discharges, and more rarely from the retrocession of eruptions, and the drying up of old ulcers, should not be overlooked, particularly as such morbid relations require a peculiar and appropriate treatment.

12. IV. The Prognosis in most cases of coma is unfavourable; for, although many will recover — even the great majority — the slighter cases will often present sudden changes. A much more

favourable opinion may be entertained of coma when it is produced by narcotics and spirituous liquors, than when it comes on in the course of febrile or malignant diseases, particularly after the absorption of morbid matters into the blood. The occurrence of epistaxis, of swellings of the parotids; the accession of the catamenia, or the hæmorrhoids; a fæculent diarrhœa; copious general perspiration; abundant discharge of urine depositing a sediment; erysipelas, eruptions, boils, gout, or rheumatism, appearing in external parts, particularly the lower extremities; and the return of sound natural sleep during a state of coma vigil, or typhomania; are very *favourable*—indeed, critical symptoms. The persistence of the affection; scanty secretion or retention of urine; subsultus; spastic contractions of one or more limbs; loss of speech, and total insensibility; distortion of the eyes; vomiting or retching; a previous breaking up of the constitution; pre-existing cachexy, and old age; bleeding from the ear, when it has been caused by external injury, as in concussion; constant supine posture, and slipping low down in the bed; coldness of the head, with sunk countenance, and cold clammy surface; loss of the faculty of deglutition, or return of matters put in the mouth; are very *unfavourable* signs.

13. V. Pathology.—*A.* Primary and symptomatic coma may be resolved into the following *pathological states*, either of which may exist singly, or in conjunction with one another:—1st, Exhaustion of the organic nervous influence supplying the brain, or torpor or suppression of it, inducing a state which may be called paralytic—a paralysis of all the cerebral functions: this condition is produced chiefly by directly or indirectly sedative causes, and by whatever depresses or exhausts the vital energy generally, or the nervous power in particular: it may be attended by anæmia of the brain; and then the coma will be preceded by, or accompanied with, convulsions, or alternate with them; but it is more frequently productive of some one of the states about to be noticed, especially congestion, and occasionally effusion within the head: it may go on to dissolution, or it may be followed by reaction and active congestion or acute inflammation; the comatose states sometimes observed at the invasion of dangerous forms of fever, and of certain apoplectic seizures, and the coma of the early stage of concussion of the brain, being of this description. 2d, Congestion of the capillaries, veins, or sinuses of the brain, is, perhaps, the most common morbid condition that obtains in coma, as respects the vascular system: but this state can scarcely arise, unless the organic nervous influence with which these vessels are supplied has been exhausted or depressed, excepting in those cases where the congestion proceeds from obstructed return of blood by the sinuses, or by the large veins coming from the head: in many cases, therefore, the existence of this state presupposes that first described, at least to some extent; and whether thus originating, or proceeding from impeded or obstructed return of blood, will equally occasion pressure of the organic nervous and cerebral tissues, and suppression of their functions: congestion of the blood-vessels within the head may, moreover, be associated with some other morbid states, as with contamination of the circulating fluid; as in the coma that occurs in the advanced stage of typhus, and when morbid secretions are absorbed into the blood. 3d, Active determination of blood to the head will seldom occasion more than lethargy or coma vigil,—states which are frequently produced in this way in the advanced stages of various acute diseases, and sometimes by the use of anodynes, which, in some constitutions, disorder the nervous functions and excite the cerebral circulation. 4th, Inflammation of the brain or membranes, owing to the tumefaction consequent on it, &c., will often be accompanied with coma; and still more frequently terminate in it, as shown in the article on that disease: and, as we have seen that coma will thus proceed from very different or even opposite states of organic nervous power, and of vascular action, it becomes a matter of the utmost practical importance to distinguish them with accuracy: but not only may those pathological conditions exist in different cases, they may obtain at different stages of the same case: thus the coma of concussion, in which the first of those conditions exists, may successively pass into congestion and inflammatory action, forming the three stages which Mr. Abernethy has very accurately pointed out in concussion of the brain; coma, accompanied with very different symptoms, and modified in degree, being present throughout. 5th, The circulating fluid itself may be more or less changed; it either being of a darker colour, and in a less decarbonised state, than in health; or having entirely lost the power of coagulating, or presenting a coagulum of a weak or dissolved texture. (See Blood, § 94.) In addition to this state of the circulating fluid, congestion of the cerebral vessels and increased action of the heart may exist, as in the advanced stages of malignant, exanthematous, and febrile diseases; these associated lesions may be also preceded by, or coexistent with, depressed vital or organic nervous energy of the encephalon. 6th, Effusion of blood or serous fluid within the brain will give rise to profound coma, generally as a consequence of either the first, second, third, or fourth preceding states, occurring either primarily, or in the advanced progress of febrile diseases.

14. *B.* It must be evident, that a successful treatment of coma, under the numerous circumstances and diversified forms in which it presents itself in practice, must be based upon a recognition of the pathological states that occasion it. But how are these states to be ascertained? The difficulty even of an approximation to this knowledge is doubtless great; but the practical results, to which the information leads, are of the utmost importance, as respects both the issue, and the reputation of the physician. I shall therefore offer a few remarks, with the view of facilitating the investigation of this subject, and placing our intentions of cure upon a rational basis. *a.* In the *first* of the above pathological states, the pulse is weak, soft, unequal, or intermitting; the pulsation of the carotids is smaller, weaker, and softer than natural; the breathing is soft, slow, or laboured, but without stertor; the limbs and muscles are relaxed, and deprived of sensibility; the surface is pale, cool, moist or clammy, particularly the extremities; the head is cool, or at least not above, frequently below, the natural temperature; the countenance is pale or sunk;

he eyes open, without suffusion, and the pupils dilated; the tongue is soft, flabby, and broad, unless in the last stages of fever, when it is covered by a brown or dark fur; and the skin is dry or harsh. The feebleness and intermissions of the pulse, the depression of animal heat, and the loss of sensibility and voluntary motion, are generally in proportion to the exhaustion of vital power in the brain, and therefore important guides in the treatment of coma. *b.* The *second* pathological condition, or that of congestion, will vary in different cases, or even in different stages of the same case, from the depressed state of vascular action and animal heat, described above, to that now to be noticed. The pulse is oppressed, or full, slow, irregular, occasionally nearly natural,—in the carotids somewhat fuller, stronger, or more labouring, than in health, or in other parts where it can be felt; the respiration is either natural or slow, laborious or irregular; the countenance is slightly tumid, bloated, or livid; the eyes are somewhat suffused and prominent, the pupils dilated and insensible; the temperature of the head is occasionally natural, but more frequently slightly increased, and the face and scalp moist; the appearance of the tongue, as in the foregoing state, varies according as the coma is a primary or consecutive state of disease; the evacuations are either retained or passed insensibly; and sensibility, voluntary motion, and mental manifestation, are abolished in proportion to the extent of depression of the organic nervous influence of the brain, and of vascular congestion. This state may supervene on the former with more or less rapidity, and terminate either in a return to healthy action, or in the *third* and *fourth* states referred to. *c.* The *third* and *fourth* pathological states are different grades of vascular action, often arising out of the preceding: that consisting of active congestion or increased determination of blood through the cerebral vessels may present nearly the same symptoms as those characterising congestion, but in a much slighter degree; sensation and voluntary motion not being quite abolished; the coma being in its slighter grades, — as lethargy and coma vigil, very rarely coma somnalentum. The pulse and respiration may not be materially affected, or it may be merely accelerated; the temperature, even of the head, may also be natural, or but slightly increased, that of the extremities being depressed; the countenance may not be materially changed; in some cases it may be even sunk or depressed; but the carotids generally beat more fully and strongly than in health; and the mental manifestations are not merely more or less suppressed, but sometimes also disordered. The state of inflammatory action, and its consequences, give rise to phenomena of greater intensity than those now noticed, and which have been very fully described in another place. (See Brain, § 180.) *d.* The *fifth state* which I have referred to, as obtaining in some cases of coma, seldom occurs alone, but is associated with one or two of the preceding, particularly the *first*, *second*, or even the *third* conditions. It is characterised chiefly by a lurid, foul, dirty, or cachectic appearance of the surface; a sunk or sallow countenance; a frequent, soft, small, or broad and open pulse: by low delirium or typhomania; starting of the tendons, and picking of the bed-clothes; preceding and associated febrile, exanthematous, or malignant diseases; and by fœtor of the secretions and excretions. In some cases, when this state has come on rapidly, the tongue is merely broad, flabby, marked by the teeth at the edges, and covered by a creamy sordes; but in the last stage of acute diseases, it is deeply furred, or coated with a thick mucous sordes of a dark brown colour, often extending to the gums, and even to the lips. *e.* The *sixth and last* state, that of effusion, may be consequent upon any of the preceding, and be caused by one or more of them. If the effusion be sanguineous, the attack is often sudden; the respiration is generally stertorous, irregular, &c.; and signs of local paralysis may often be detected. (See Apoplexy.) If serum be effused, the coma is as profound as that caused by sanguineous effusion; but slower in its accession, and less frequently attended by stertorous breathing, and local paralysis; it is also more commonly preceded by signs of inflammation, active determination, or congestion of blood, within the head. (See Dropsy of the Encephalon.)

15. VI. Treatment.—The foregoing pathological states will often insensibly lapse into one another, as in concussion and inflammation of the brain, giving rise to distinct stages of these diseases, and requiring a different treatment for each; and, according as they may thus vary, so will their symptoms be modified; the principal phenomena connected with the cerebral functions, the pulse, the respiration, the animal temperature, the state of the head and carotids, &c. being the practitioner's guides in the direction and combination of his means of cure. These means will now require no further notice than a bare enumeration, as they are more fully discussed in the articles on the diseases in which coma, in one or other of its forms, most commonly presents itself.

16. *A.* The *first* pathological state (§ 13, 14. *a.*) requires stimulants and counter-irritants; but these remedies must be exhibited with much caution; as an excessive or inappropriate use of them might produce, even in the slighter cases of cerebral exhaustion, determination of blood to the head, and convert congestion into inflammation,—consequences which will frequently supervene, at least in a slight degree, as in concussion, notwithstanding the utmost care to avoid them. The preparations of ammonia, musk, and camphor, internally and externally employed; enemata, containing the same medicines, or the infusion of valerian, castor, assafœtida, or the terebinthinates; wine and cordials, given frequently and in small quantity; irritating or vesicating embrocations, cataplasms, sinapisms (Celsus, Aretæus, Paulus Ægineta, to the head), and plasters, as well as moxas, and the cautery (Zacutus Lusitanus, Rhodius, and Severinus) applied to various parts, or even to the head itself; blisters to the nape of the neck, behind the ears, or to the head (Bonet, Lanzani, Sydenham); volatile substances held to the nostrils or applied to the temples; errhines (Cælius Aurelianus, &c.); urtication (Aretæus, Selti); galvanism and electricity (Hufeland, &c.); the affusion of warm, tepid, or, in some, cold water on the head; active and stimulating emetics (Riviere, Rigal, &c.); purgatives combined with stimulants, antispasmodics, and tonics;

cathartic clysters, conjoined with similar substances; the use of coffee and green tea, particularly when this state of disease has followed the ingestion of sedative or narcotic poisons, and after the stomach has been evacuated by emetics and the stomach pump, and washed out by the injection of warm water; are severally of use in this state of coma, and may be resorted to in various combinations, according to the circumstances and severity of the case. All these measures are, however, not equally applicable to every case where this pathological state may be presumed to exist; but the judgment and experience of the practitioner can alone enable him to employ them in an appropriate manner; the shades of difference in particular cases requiring certain means, or peculiar combinations of them, scarcely admitting of description, at least within the limits to which I am necessarily confined.

17. *B.* The *second* pathological state (§ 13, 14. *b.*), when closely verging, as it occasionally does, upon the first, will require several of the means enumerated with respect to it; whilst, when fully formed, and approaching that of active determination or congestion, but few of them are applicable. Much, however, will manifestly depend upon the habits and the constitution of the patient; upon the nature and duration of the disease of which coma is an advanced phenomenon; and upon the state of the pulse, the temperature of the head, and the character of the countenance. The *first* state is injured by blood-letting in any form, it being even not an infrequent consequence of inanition, or even of anæmia of the brain; but this second state will generally be benefited by depletion, and in proportion to its approximation to the *third* and *fourth* states described above (§ 13, 14. *c.*). The question chiefly is as to what extent it may be carried, and the manner in which it may be performed. In the majority of cases, local depletions, by cupping between the shoulders and nape of the neck, or by leeches applied behind the ears or on the neck and occiput; by simple scarifications by a lancet in the last-named situation in some cases; in others bleeding from the feet whilst they are placed in warm water, and cold or tepid water is being poured in a stream upon the head; and in certain instances the application of a number of leeches on the inside tops of the thighs, or about the anus; are the preferable modes of having recourse to depletion in this state of disease; but the extent to which the evacuation should be carried must entirely depend upon the symptoms and circumstances of the case, and the effects produced by it. In addition to this important means, purgatives ought to be given by the mouth, and their action increased by cathartic clysters, in which either assafœtida, valerian, camphor, the terebinthinates, or other antispasmodics and stimulants, may be also exhibited. Counter-irritants and derivatives should be applied, but at a distance from the head; and, while a frequent operation of the bowels is procured, the functions of the skin and kidneys should be promoted by diaphoretics and diuretics, the extremities being kept warm, the head cool, its hair cut off, and the shoulders highly elevated. In many instances of this state, even local depletion should be cautiously employed; and in these, as well as in others, much advantage will often accrue from having recourse to restorative means. It is in this pathological condition of coma, and in those about to be noticed, that oil of turpentine, in large doses, so as to act freely on the bowels, has proved so beneficial in my practice. This state very generally obtains in coma from narcotics and spirituous liquors; and is then, especially, very remarkably benefited by the cold affusion on the head, and the preparations of ammonia.

18. *C.* The *third* and *fourth* states (§ 13, 14. *c.*) require nearly the same treatment as the second, but carried much further; general and local depletion, cold affusion on the head, or the application of ice, or evaporating lotions; the most active cathartics, clysters, and derivants or counter-irritants, and the other measures, as fully pointed out in the article on *Inflammation of the* Brain (§ 174.), When these states have gone on to effusion either of blood or of serum, — the *sixth* pathological condition adduced, — the treatment recommended in Apoplexy and in Dropsy of the Encephalon (see these articles) should be employed.

19. *D.* The *fifth* pathological state obviously requires stimulants, tonics, and antiseptics, particularly camphor in considerable doses; the chlorides of soda, potash, &c.; wine, with cordials, spices, &c.; bark, with camphor; purgatives conjoined with stimulants, so as to excite the eliminating or depuratory functions; cathartic, tonic, and antiseptic clysters; calomel, combined with camphor and ammonia, or musk; the turpentines given by the mouth, and in enemata, with capsicum and aromatics; external derivation and counter-irritation; the various balsams, with the chlorides, &c.; quinine, with the aromatic sulphuric acid; the preparations of cinchona or cascarilla with soda, or with the muriatic acid, or muriatic æther; Cayenne pepper internally, as well as externally in camphorated embrocations, &c. When coma is consequent upon the retrocession of gout, rheumatism, erysipelas, or cutaneous eruptions, the propriety of having recourse to sinapisms, rubefacient pediluvia, and other derivatives, in addition to such other means as the symptoms of the case may suggest, must be obvious. If it follow suppressed discharges, we should endeavour to restore these, or produce one supplemental of them. (See the treatment of the diseases of which coma is most frequently an important symptom.)

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CONCRETIONS, BILIARY. — SYN. *Calculi or Lapilli Cystici; Calculi Fellei; C. Biliares; C. Biliarii; Cholelithi; Hepatalgia Calculosa;* Var. Auct. *Concrementa Biliaria*, Soemmerring. *Chololithus*, Good. *Calculs Biliares*, Fr. *Die Gallenstein*, Ger. *Gall-stones.*

CLASSIF. 1. *Class*, Cœliaca; 2. *Order*, Splanchnica, *Gen. iii.* (*Good*). I. CLASS, II. ORDER (*Author*).

1. DEFIN. *Concretions formed in the bile-passages, and occasioning in many instances more or less disturbance, with paroxysms of pain commonly referred to the right epigastrium and hypochondrium, reaching to the back, &c., with increased suffering whilst passing into the alimentary canal, and often giving rise to sickness or vomiting, to jaundice, and severe attacks of colic.*

2. Biliary concretions were first noticed by BENEVENIUS, FALLOPIUS, VESALIUS, KENTMANN, and FERNELIUS, who were nearly contemporaries. They were afterwards more accurately described by GLISSON, HOFFMANN, MORGAGNI, BIANCHI, BOERHAAVE, VAN SWIETEN, and particularly by HALLER; and the more recent researches of HEBERDEN, SOEMMERRING, THOMSON, THENARD, BOSTOCK, MERAT, and CHEVREUL, have greatly advanced our knowledge of their nature and pathological relations. Notwithstanding the frequency of these concretions, and the very serious symptoms they occasion, but little attention has been paid to them by practical writers since the appearance of SOEMMERRING's *Treatise;* and they have been nearly overlooked by the majority of systematic writers. HALLER remarks (what every pathologist will acknowledge), that they are infinitely more frequently found in post mortem researches than calculi of the urinary passages; and HEBERDEN agrees with him in admitting that, while urinary calculi are much more common in the male, biliary concretions are most frequent in the female sex — probably in the proportion of one in the former, to four or five in the latter.

3. I. DESCRIPTION. — Biliary concretions vary remarkably as to form, size, number, and colour, as well as composition. *a*. They may exist in any *number* — from one to a thousand, or even more. MORGAGNI, WALTER, and BAILLIE, have found the latter number; and SOEMMERRING, with many of the authors referred to at the end of the article, have observed from fifty to several hundreds, and even upwards, either in the gall-bladder, or in the ramifications of the hepatic ducts. When thus numerous, they are usually very small — the size of pin-heads, or but little larger — of a dark brown, green, or greenish yellow colour, sometimes almost filling the gall-bladder, and occasionally slightly agglutinated by thick bile. More frequently, however, a small number, or two, three, or four are detected, and very often only one. When only two or three are found, they sometimes are jointed into each other, or have their opposite surfaces smooth or flat. In rare instances they seem divided by a septum. *b*. When one, two, or three only exist, they are usually large, but they seldom reach the *size* of a hen's egg, or are much larger than a walnut. Dr. SAUNDERS, however, has found one of the bulk and figure of the gall-bladder, which it filled. They are not infrequently as large as a pigeon's egg, or as a hazel nut; and are often found from that size downwards. *c*. Their *colour* varies through every shade of black, green, brown, yellow, white, &c., that of the surface often differing from the centres and certain of their layers. They are often beautifully mottled or marbled; sometimes white and shining like spermaceti; at other times dull like wax; occasionally lamellated; often crystallised or striated, either with or without distinct centres, which are frequently different in colour and composition from the portions crystallised or collected around them. They are also more or less opaque, or slightly translucent. *d*. Their *form* varies from a round, oval, or oblong — when they are solitary — to a cone, a cube, pentagon, polygon, &c., when more numerous. They are usually smooth, sometimes polished, particularly the surfaces that have been in contact with each other; more rarely rough or glabrous, and occasionally they appear as broken into fragments. *e*. Their *consistence* also varies from what is barely sufficient to preserve their form, to that which does not yield to the pressure of the finger, and is divided by a knife with difficulty. *f*. Their *specific gravity* is much more frequently below, than above, that of water; consequently, they are commonly found swimming on the surface of water when the evacuations are mixed with it.

4. *Situation and Composition.* — Biliary concretions have been found in every part of the biliary passages: — 1st, In the radicles of the hepatic ducts; 2d, In the hepatic duct, and its ramifications; 3d, In the cystic duct; 4th, In the gall-bladder; and, 5th, In the common duct. They have been likewise found in every part of the intestines, in their passage out of the body; and, in rare instances, in the stomach, whence they have been observed to have been ejected by vomiting. These concretions are often the result of obstruction to the course of the bile; and are then generally found to consist of an admixture of inspissated bile with mucus. But more frequently they are a consequence of an alteration of this fluid from its healthy constitution, as respects either the presence of elements foreign to it, or the superabundance of those which are the least soluble, and which are precipitated during the retention or accumulation of bile in the ducts and gall-bladder; the latter being most commonly the case. Of this description are the concretions formed of a crystallisable fatty matter described by POULLETIER DE LA SALLE and FOURCROY, under the name of adipocire, afterwards by MARCET, BOSTOCK, &c., and named *cholesterine* by CHEVREUL. Some biliary calculi consist almost entirely of this substance. Others are formed of mucus and the thickened yellow matter, or the resin, of bile; and many are composed of cholesterine, the yellow matter, and the resin. Instances

of concretions different from these in composition have been noticed by MARCET, ORFILA, and CAVENTOU, but they are very rare. The greater part of these that consist of cholesterine have inspissated bile for nuclei, which, having passed along the hepatic ducts into the gall-bladder, form the centres around which the cholesterine crystallises. All these are soluble in warm alcohol, which deposits the solution in brilliant crystallised plates when cold; also in spirit of turpentine, and in the æthers, or in an admixture of turpentine and æther, leaving more or less of a residuum, according to the quantity of mucus or animal matter they contain. They also form a soapy solution in the caustic alkalies, melt at a high temperature, are inflammable, and insoluble in water.

5. The formation of biliary concretions in the radicles of the bile-ducts has been disputed; but M. CRUVEILHIER has given a very fine illustration of this rare occurrence in his excellent pathological work. When found in this situation, they generally consist of very small grains, of variable size and form, and of a dark green colour, disseminated through the healthy structure of the liver, and are formed chiefly of inspissated bile. Biliary concretions are most commonly found in the gall-bladder, and are usually the consequence of the remora or accumulation of bile; the absorption that takes place of its watery parts during its retention probably occasioning the precipitation or concretion of such of its more solid ingredients as it can no longer hold in solution or in suspension. SOEMMERRING, however, supposes that they form very rapidly, without any absorption or inspissation of the retained secretion; and this is probably more frequently the case, particularly in respect of those consisting chiefly of cholesterine, and when irritation of the internal surface of the gall bladder produces a morbid secretion, which may combine with the less soluble ingredients of bile, or dispose them to crystallise, particularly when they are secreted in larger quantity than natural, owing to a defect of the assimilating functions, and consequent accumulations of the elements of a morbid biliary secretion in the blood.

6. II. SYMPTOMS. — Calculi in the gall-bladder seldom give rise to any marked or definite symptom unless they are very large, obstruct the outlet of this receptacle, or excite inflammation of its mucous surface. Every experienced practitioner must have met with cases in which these concretions have been evacuated, and others also in which the gall-bladder has been found, after death, filled with them, without any ailment referrible to this organ having been complained of. The symptoms, therefore, usually stated to proceed from concretions in the gall-bladder should be viewed with limitations, inasmuch as they are not necessarily consequent upon their actual presence in it, and as they may proceed from some other pathological states. But, whilst we should view these symptoms with caution, we ought not to reject them; for, although concretions may form, and even pass into the alimentary canal, without creating much disturbance, or giving rise to any symptom distinctive of the existing derangement, yet not infrequently their presence, particularly their passage from the gall-bladder into the intestines, occasions such a train of morbid phenomena, as will often enable the observing practitioner to form a correct diagnosis.

7. *A. Of calculi in the gall-bladder.* — Patients with biliary calculi often complain of a sense of weight and oppression at the epigastrium, and right hypochondrium, with cardialgia and various dyspeptic symptoms, especially after a meal, with constipation or slight irregularity of the bowels, an occasional deficiency of bile in the evacuations, and sallow or yellowish tint of the countenance and skin. In some cases a dull pain in the epigastrium, with a tympanitic fulness, is felt (STRACK); and in lean persons, a distinct tumour below the anterior margin of the right ribs may occasionally be detected, particularly when signs of obstructed excretion of bile have previously existed, indicating its accumulation in the gall-bladder. These may be all the symptoms, and often so slight as not particularly to interest the patient; they may, even when most evident, continue a longer or shorter time, until, at last, the pain and uneasiness increase, — especially when the patient turns, or lies upon the left side, uses exertion, rises quickly to the erect posture, takes a full inspiration, or soon after a meal, — and extend to the right hypochondrium, to the back or right shoulder-blade, sometimes to the right breast, shoulder, arm, and side of the neck, and even throughout the abdomen, particularly to the right flank and hip.

8. *B. The symptoms indicating the passage of concretions into the intestines* may not differ materially from the above, excepting in their severity and duration; and they often have little relation to the size of the calculus. When the concretions still remain in the gall-bladder, they occasion either little or no disturbance, or such as has been now described, in a more or less continued form. But when they are passing along the ducts, the symptoms are often very sudden in their invasion, of much greater intensity, of shorter duration, and generally recur in paroxysms. The pain is then frequently very acute, is attended by nausea, flatulence, or vomiting, by a bitter taste in the mouth, acid or bitter eructations, irregularity of bowels, colic, or distension of the abdomen, &c., and is followed by either a complete jaundice, or a slight yellow tint about the eyes or lips, the cheeks being clear. This discolouration commonly passes off soon after the paroxysms of suffering, which often come on about two hours after a full meal, and it either recurs along with, or follows closely upon, them; but it is not, nor, indeed, any of the symptoms enumerated, constantly observed, as COE, J. P. FRANK, and others, have demonstrated, and as every experienced practitioner must have remarked, even when large concretions have found their way into the bowels. The pulse is generally unaffected, and there is no fever, unless in the more violent seizures, or after their frequent recurrence or long duration; when, in addition to these symptoms, loss of flesh and strength, a furred, loaded, dark yellowish tongue, great restlessness, anxiety, and tenderness at the epigastrium, and right hypochondrium, are observed. The intervals between the attacks are extremely variable. Sometimes the paroxysms are periodic; and are evidently owing, on these, as well as on other occasions, either to some change in the position of the concretions, or their passage into the intestines,

or to inflammation produced by them in the gall-bladder and ducts. In many instances they are most excruciating; the patient is bent double, rolls about in great agony and anxiety, or presses upon the epigastrium, and complains of an acute or lacerating pain in the region of the ducts and duodenum, either with leipothyma or syncope; or with retching, distension of the abdomen, and severe colic. Females — who are most subject to these seizures — sometimes experience more suffering from them, than from parturition; and even in them the pulse may not be affected. The bowels are more frequently constipated than relaxed, and the motions are often devoid of bile, although diarrhœa be present. The most acute attacks may terminate as suddenly as they commenced, the patient soon recovering his strength and functions, unless more calculi remain to be passed. They are usually of short duration — not exceeding a few hours; but they become longer after their repetition, sometimes at last continuing several days, with partial remissions. Occasionally they are preceded by a sensation of something unusual, or alive, in the region of the stomach, or in various parts of the abdomen; and attended by dryness or slight pain of the throat, thirst; inability to straighten the trunk, or to keep it erect; by scanty, orange, or high coloured urine, and slight strangury.

9. C. *The affections and lesions sometimes caused by biliary concretions* attach to themselves much interest. In some cases, violent convulsive motions come on, from the pain and irritation they occasion, either with or without vertigo, headach, and cerebral congestion. Mental depression, obstinate dyspepsia, hypochondriasis, and melancholia; also flatulent and colicky states of the bowels, constipation, and diarrhœa; are not only frequent attendants upon, but also consequences of, biliary concretions. The less common disorders they occasion are, dyspnœa, syncope, slow remittent states of fever, hæmorrhoids, suppres-pression of the catamenia, and apoplexy (BURSERI). The effects produced by them upon the gall-bladder and ducts are often most important; inflammation, thickening of their coats, ulceration, great dilatation of the ducts, adhesion of them, or of the gall-bladder, to the duodenum, or of the latter to the stomach, liver, or colon, or even to the parietes of the abdomen, with ulceration, and passage of the calculus into any of these parts of the digestive canal, or through an external opening at the right epigastrium, having been observed by several eminent authorities. COLOMBUS states, that, upon the examination of the body of the celebrated IGNATIUS LOYOLA, a biliary calculus was found to have ulcerated its way through the gall-bladder, into the trunk of the vena porta. CHESELDEN mentions a case in which two large calculi made their way, by inflammation and ulceration, through the abdominal parietes; and similar instances are recorded by HOFFMANN and CRELL, in one of which about eighty small calculi passed out through a sinuous ulceration below the right ribs. TOLET states a case in which a biliary concretion of the size of a pigeon's egg was discharged from an ulceration at the umbilicus; and BUETTNER saw thirty-eight calculi discharged in the same situation. SCHURIG mentions an instance of two such concretions having been taken from an abscess in the anterior abdominal parietes, opened by FABRICIUS; and cases have been recorded by BLOCK, HALLER, WINCKEL, DIXON, CALLOWAY, and BAFFOS, of tumours having formed below the cartilages of the right false ribs, followed by inflammation, ulceration, and the discharge of biliary calculi of various sizes. SOEMMERRING states, that he has a preparation of a gall-bladder filled with concretions, and having an ulcer at its fundus, through which one of them had escaped. J. P. FRANK found, in the body of a woman who died during the puerperal state, the gall-bladder ruptured, and containing calculi, to which he attributes the rupture; and he met with another case in which the calculi had occasioned abscess and rupture of this viscus. Mr. BRAYNE has detailed an interesting case, in which adhesion of the gall-bladder to the duodenum had occurred, and in the centre of this adhesion an ulceration into the intestine had taken place, through which a very large calculus had passed, and been discharged by stool, a considerable period before the death of the patient; and similar instances are alluded to by Dr. SAUNDERS, as having been observed by Dr. CHESTON and Mr. CLINE. It is not improbable, that in some of the instances on record, in which biliary concretions have been voided by vomiting, adhesions of the gall-bladder to the stomach had taken place, and the concretion had made its way by ulceration at the place of adhesion into this viscus, from whence it had been ejected. A reference to the cases recorded by SCHURIG, ORTESCH, and BIONDI, in which biliary concretions had been evacuated from the stomach, will show that this is not an unreasonable inference.

10. Besides the usual appearances produced by inflammatory action in the coats of the gall-bladder, viz. adhesion to adjoining parts, thickening, ulceration, &c., they have been found almost or altogether destroyed by suppurative ulceration. In a case detailed by Dr. SCOTT, they were half an inch in thickness; and HALLER observed them destroyed by suppuration and ulceration — the calculus that had caused the inflammation lying in the midst of a disorganised and puriform matter. Obturation of the ducts has been often found on dissection, the gall-bladder being at the same time enormously distended by accumulated bile. In many cases, the ducts have been found very much dilated after the passage of large calculi through them. Such cases have been recorded by WALTER, DIETRICH, RICHTER, THOMAS, CRAIGIE, &c. HEISTER found the common duct dilated so as to admit his little finger. MORGAGNI states, that he has observed the same duct so wide that its diameter was nearly two fingers' breadth; and SOEMMERRING has preserved, in his museum, several specimens of great dilatation of this canal. RUYSCH and BLUMENBACH have found biliary concretions in the substance of the liver; and others that had perforated the cystic duct, and caused ulcerations of both the liver and duodenum. WALTER observed the ramifications of the hepatic duct, throughout nearly all the liver, enormously dilated, and filled with bile and some thousand small calculi; and CRUVEILHIER and myself have met with very great distension of all the ramifications of this duct, with thickening of its coats, and concretions mixed with viscid bile throughout their canals. It is obvious that concretions, either in

the hepatic ducts or in the gall-bladder, will sometimes give rise to very serious disease of the liver itself. A torpid state of this viscus, so frequently observed in connection with their formation, is rather their cause than their effect. Hence obstruction of the liver, and its consequences, particularly dropsy in some one of the shut cavities, or the cellular tissue, are of more frequent occurrence than inflammation of this organ; but, nevertheless, both acute hepatitis and abscess of the liver have been sometimes met with, owing to biliary concretions.

11. *D.* When biliary concretions, particularly those of a large size, have passed into the intestinal canal, they often give rise to very severe and even dangerous symptoms. Cases have been referred to in the article Cæcum, in which I had seen fatal results, consequent upon the passage of biliary calculi into the appendix of the cæcum, they having produced inflammation, ulceration, or gangrene of this process, and, consecutively, fatal peritonitis: and, in the case recorded by Civadier, where a biliary concretion had escaped by an ulceration in the right groin, it is very probable that it had passed out through the cæcum, by inducing inflammation and ulceration of this part. The more common consequences, however, are, thirst, constipation of the bowels, colicky pains, sometimes tenderness on pressure referred to a particular part of the abdomen, followed by tenesmus, alvine evacuations, and the passage of the calculus. When it is very large, the symptoms will be the same as enumerated with reference to *Intestinal* Concretions, or it will produce severe colic or ileus. Instances of fatal results, sometimes occurring very rapidly, from biliary calculi, have been adduced by several of the authors already named, as well as by Bianchi and Richter; those of a slower progress have presented, with various organic lesions and dropsical effusions into the large cavities, — consequences which have sometimes not appeared until a remote period from the voiding of concretions.

12. III. Causes. — Biliary concretions occur much more frequently in the female than in the male sex, and during the decline of life, than at an early age. They are very rarely met with much before the prime of life, and still more rarely in children. Their generation is favoured by the phlegmatic, bilious, and melancholic temperaments; by the violent or depressing passions — particularly anger, sadness, anxiety, &c.; the use of spirits; by sedentary occupations, rich and full living; protracted sleep; by sitting with the body bent forwards after meals (Hoffmann, Van Swieten, Coe); by chronic dyspepsia and costiveness; and by imperfect assimilation and corpulency. Torpid or disordered function of the liver and gall-bladder; inaction of the latter and of its ducts; and a vitiated secretion of the bile itself; are obviously connected with the production of these concretions. Several writers have supposed that they arise from a putrescent state of the bile retained in the gall-bladder; but, as Goldwitz and Soemmerring have shown, this change, even granting it to occur, would rather prevent than favour their production. Various writers, as Leake, suppose that they are formed from the inspissation of the bile in the gall-bladder, from absorption of its watery parts: but this cannot be the only or even a principal cause, as we often find this secretion remarkably thickened from long retention in this receptacle, without such formations. The absorption can, therefore, only favour the occurrence of other changes in the bile, to which certain peculiarities in its composition strongly dispose it. The very small concretions which occur in the ramifications of the hepatic duct generally consist of inspissated bile and mucus; and these, as they pass into the trunk of this duct, or are carried into the gall-bladder, may become the nuclei around which the superabundant cholesterine in the bile collected in the gall-bladder or in the ducts may crystallise; the increased quantity of this fatty matter in the bile being the chief pathological condition connected with their formation. As far as my own observation has extended, these concretions have occurred in persons whose assimilating functions have been imperfect. That the liver performs an assimilating as well as a secreting office, has been shown by me in another work (see *Appendix* to Richerand's *Physiology*, p. 580.); and when, either from torpid function of this organ, or from imperfect action of the other assimilating viscera, the chyle is not perfectly animalised, fatty matter abounds in the circulation, and is modified into cholesterine during its excretion by the liver — that portion of it which the watery parts of the bile cannot preserve in solution, crystallising into biliary concretions upon the occurrence of the circumstances favouring this change. The fact, that these concretions are most commonly met with in fat persons, in whom assimilation is defective, and at that period of life when it begins to flag, — imperfect assimilation causing the superabundance of fatty matter in the circulation, and its consequent deposition in the adipose tissue — seems a strong proof in favour of this opinion, which is further confirmed by the circumstance of my having observed the serum whitish or milky on two occasions on which blood was taken from persons with biliary calculi, — an appearance now demonstrated to arise from the superabundance of fatty matter in the serum (see Blood, § 104.). I need not occupy my limits with the various speculations, or opinions, entertained by authors respecting the remote as well as pathological causes of biliary concretions, particularly as the most of them have been found to be erroneous. Those who are curious respecting them, will find almost all of any consequence that has been adduced on the subject, in the references at the end of the article, and particularly in the works of Coe and Soemmerring.

13. IV. The Diagnosis and Prognosis can only be inferred from the entire history and contingent circumstances of the case; as there are no symptoms, which, from their constant presence, or relation to certain pathological conditions, will of themselves enable the practitioner to form a correct judgment as to the precise nature or result of the disease: and yet the experienced and observing will very generally draw tolerably correct conclusions as to both, from reasoning on the procession, relation, or grouping, of the symptoms present: and, although the disease is not frequently fatal, he will often have reason to be cautious in hazarding an opinion as to the ultimate or remote result; especially as the same morbid condition of the system that

gives rise to these concretions, often occasions other dangerous maladies, even although the concretions themselves do not produce any fatal lesion, or even serious disorder.

14. V. TREATMENT.— The measures required in cases where the concretions are presumed to be in the gall-bladder, are somewhat different from those, which their passage along the ducts usually demands. 1st. When the symptoms lead us to suspect the presence of concretions in the gall-bladder, the medicines recommended by SOEMMERRING may be prescribed in various states of combination. These consist of the sub-carbonates of the fixed alkalies, the muriate of ammonia, the acetate of potass, the spiritus ætheris nitrici, the liquor potassæ, Castile soap, the extracts or decoctions of taraxacum, herba saponaria, the fumaria, &c. It is obvious that deobstruent aperients, and the above medicines, will often have much influence in improving the biliary secretion, and promoting its discharge into the duodenum, particularly when the patient takes regular exercise in the open air, and saline mineral waters. The remedy of DURANDE, consisting of three parts of the spiritus ætheris sulphur. comp., or the sulphuric æther, and two of rectified spirits of turpentine, given in doses of half a drachm to a drachm, has been much employed on the Continent; and, although it generally occasions unpleasant eructations, and sometimes increases the sickness, it has received the commendations of SOEMMERRING and RICHTER, who advise it to be given after the exhibition of emollient, resolvent, and aperient remedies; and to be followed, particularly in cases where the passage of the concretions along the ducts is suspected, by the repeated use of gentle laxatives. I have prescribed the remedy of DURANDE in somewhat larger doses, and combined with it the tinct. of hyoscyamus, and certainly with marked benefit. Numerous French and German writers speak favourably of this medicine, while others fear its effects in cases where inflammatory action may exist. But my experience has proved that it will not aggravate such action, and far less give rise to it.

15. The *deobstruent* medicines that are most to be depended upon in this state of disease, are, the extract or decoction of taraxacum in large doses, with the alkalies (F. 77. 391.), the sub-carbonates, the acetates, or the sub-borates of the alkalies; or with soap, ammoniacum, blue pill, small doses of vini antimonii tartarizati, and the æthers (F. 397. 503—510. 837.). After these have been exhibited for some time, DURANDE's remedy may be taken on the surface of any fluid, or mixed in the yolk of an egg. Active purgatives or cathartics are upon the whole less beneficial than a frequent repetition of *laxatives*, or of such purgatives as are gentle and emollient in their operation; and even these, when exhibited early, are generally less successful than when deferred to a more advanced stage of the treatment. The oleum ricini, in doses of about one or two drachms, triturated with mucilage, or with the yolk of an egg, and repeated every five or six hours until it operates, manna, the oleum olivæ, the acetate of potass, &c., and warm milk whey, are the most appropriate laxatives. In many instances, a full dose of calomel, or five grains of blue pill, may precede their exhibition, as either of these often proves beneficial, especially when combined with a full dose of hyoscyamus, and about a grain of camphor, and without any risk of those unpleasant effects imputed to it, or rather dreaded from it, by various Continental writers. The operation of *laxatives* should be promoted by the exhibition of oleaginous, saponaceous, and emollient *clysters*. As to the use of *emetics*, opposite opinions have been advanced. HOFFMANN, DURANDE, and FRANK very justly express themselves decidedly against them; and, indeed, BERTIN declares that he has met with cases, in which they caused rupture of the gall-bladder, its duct being obstructed by a calculus.

16. 2d. Those cases in which the symptoms indicate the passage of concretions into the bowels (§ 8.) require, in addition to the means above enumerated, warm anodyne fomentations; the belladonna plaster placed over the right hypochondrium; the exhibition either of this narcotic internally, or of the acetate of morphine, opium, or hyoscyamus; the remedy of DURANDE, or the combination of it with one or other of the medicines now mentioned. In some cases, an anodyne and discutient liniment (F. 297. 313.) may be placed over a warm poultice, and applied to the chief seat of pain. Local or general *depletion* is seldom of much service either in this or the preceding state of the disease, unless the existence of vascular plethora, or of tenderness of the hypochondrium and epigastrium, the state of the pulse, or habit of body, indicate it, when it should not be omitted. If tumour and tenderness of these regions, with other marks of inflammation of the gall-bladder and ducts, manifest themselves, general and local *blood-letting*, followed by poultices and fomentations, are requisite. In such cases, as well as in the more violent paroxysms of the malady, the treatment recommended by BRICHETEAU—of the success of which, in some very obstinate and instructive cases, he has adduced very striking proofs — may be put in practice. This consists of the application of a bladder, containing pieces of ice, over the seat of pain; of repeating it, as soon as the ice is dissolved, until relief is obtained; and of administering subsequently mild laxatives and clysters until the bowels are freely evacuated. MERAT had previously advised the injection of cold enemata; and DURANDE, of those which are tepid; but the cases adduced by BRICHETEAU seem conclusive of the superior efficacy of the means he has recommended. PETIT has contended for the propriety of making an early opening into such tumours at their more prominent part, with the view of evacuating the calculi, or the accumulated bile, which the gall-bladder cannot expel owing to occlusion of its duct. But the incertitude of adhesions having been formed between its fundus and the abdominal parietes, and of success even although they have actually taken place, must prevent every physician from directing the performance of this operation. In the majority of cases, the tumour will point outwardly, and either open spontaneously, or arrive at that stage which will warrant the artificial opening of it if the adhesion have formed. Even in three such cases, MORGAGNI found only one which healed up favourably; the other two long remaining in the state of fistulous ulcerations. — " Ergo non, nisi in adhesione vesiculæ felleæ ad integu-

menta abdominalia, tentenda exulceratio est, vel apertura artificiosa." (Soemmerring.)

17. 3d. When the previous ailments and the existing symptoms indicate that the concretions have passed into the bowels, the use of gentle laxatives, as advised above, or the treatment directed with respect to *Intestinal* Concretions, and Colic, is strictly appropriate. In some instances, when the calculi are large, they will give rise to much suffering referred to the cæcum, the sigmoid flexure of the colon, and to the rectum; they occasioning, in this last situation, constipation, colic, and urgent tenesmus. In these cases, the rectum should be carefully examined, and mechanical as well as medical means used to facilitate the passage of the concretion.

18. 4th. After the patient has been relieved, and, indeed, during the continuance of the treatment, the evacuations should be carefully examined, and mixed with water, with the view of detecting the concretions,—this being of much importance as respects not merely the diagnosis, but also the treatment. If we have reason, either from their presence in the motions, or from the disappearance of ailment, to presume that they have been evacuated, remedies ought to be prescribed with the view of improving the digestive, assimilating, and biliary functions. The use of taraxacum with soda, &c. (F. 76. 392.); of gentle and deobstruent aperients; of vegetable bitters, with the alkaline preparations, and laxatives; regular exercise; light digestible food, and ripe fruits; a moderate use of lean but fresh meat; the strict avoidance of fatty substances and of spiritous liquors, of mental disquietude, and of all the exciting causes (§ 12.); should be enjoined, and the patient recommended change of air, the Cheltenham or Leamington mineral waters, and the artificial waters of Seidlitz, Scheidchutz, Eger, Pyrmont, Spa, and Carlsbad, according as they may be respectively appropriate to the circumstances of particular cases.

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CONCRETIONS — Intestinal.

Syn. — *Alvine Concretions*; *Alvine Calculi*, Monro. *Calculous Concretions*, Andral. *Intestinal Calculi*; *Enterolithus*, Good.

Classif. — I. Class, II. Order (*Author*, in *Preface*).

1. Defin. *Substances accreted into solid masses in some part of the alimentary canal, chiefly owing to imperfect action of the digestive functions and nature of the ingesta, and giving rise to dangerous states of disease.*

2. I. Calculous Concretions occasionally form in various parts of the human alimentary canal; and, although generally the result of weak digestive function, hence, a consequence of disease, they are, in some cases, the chief cause of extreme suffering and danger. They are most commonly found in some part of the intestines, particularly the cæcum and large bowels; but they are sometimes also formed in the stomach, and there reach a very large size. Bonetus, in his *Sepulcretum Anatomicum*, relates two cases, in each of which a stone as large as a hen's egg, and weighing four ounces, was found in the stomach; and a third case, in which this viscus contained nine calculi weighing together three ounces and a half.

3. i. Origin and Composition. — Intestinal concretions are of several kinds, varying extremely in their nature and origin. In very rare instances they have assumed the appearance of *bezoars*, as in the case recorded by MM. Champion and Bracconnot, who ascertained their nature by chemical analysis. In some cases, they consist chiefly of earthy deposits, in obscurely crystallised layers, around a distinct nucleus; in others, they are formed principally from those parts of the ingesta which are incapable of change during the digestive processes. The concretions which Dr. Good names intestinal calculi, and which consist chiefly of earthy deposits, are found in the human intestines, as well as in the alimentary canal of the larger ruminating animals. They are generally formed in concentric layers, and are often radiated, sometimes very obscurely, from nuclei, which are either gall-stones, or some hard foreign body. They are more or less porous, either spheroidal

or oblong, and vary from the size of a pea to that of a hen's egg; and sometimes reaching a much larger size.

4. With respect to their *origin*, they may be divided into three varieties: — 1st. Those which have arisen from nuclei formed either in the alimentary canal, or in the biliary apparatus, such as gall-stones, inspissated mucus, &c., around which certain saline and animal particles have attached themselves during their abode in the intestines. 2d. Those having nuclei consisting of foreign bodies, such as fruit-stones, seeds, or the husks of seeds, fragments of bones, &c., around which the alimentary particles have collected and crystallised, so that without the presence of the nucleus the calculus would not have been formed: and, 3d. Those which are formed entirely in the alimentary canal, and which are generally more or less homogeneous, and present no distinct nuclei.

5. The concretions of the *first* class have their nuclei or central part composed chiefly of cholesterine, the yellow colouring matter and the resin of the bile, surrounded by layers of a mixture of the phosphate of lime, and of the ammoniaco-magnesian phosphate, with animal matter. HALLER supposed that the saline constituents of these, and, indeed, all the other calculi, were furnished by the pancreatic juice; and that the resinous parts were derived from the bile. That such are the chief, although not the only, sources of these constituents respectively, will not, I think, be disputed.

6. Those belonging to the *second* class are nearly similar as respects their outer layers; their central parts varying according to the nature of the substance or substances forming their nuclei. This kind of intestinal calculi are not infrequent in those parts of Scotland where the inhabitants live chiefly upon oaten bread; the beard and fibres of the husks of the oat resisting digestion, and collecting together, so as to form concretions or nuclei, around which saline matter, with accessions of these fibres, collect. The external layers of the calculus formed from this source are generally solid, compact, soft to the touch, and composed of saline matter: in other instances, the outer layer has a velvety appearance, and consists of very fine fibres closely united. Dr. MARCET found these concretions to consist of compact layers of fibrous substances and of phosphates. The following is his analysis: —In 100 parts, 25·20 were animal matter; 3·90, resin; 5·16, ammoniaco-magnesian phosphate; 45·34, phosphate of lime; and 20·30, vegetable fibres. The vegetable fibres were cemented together by deposits of earthy matter, and the animal matter.

7. Some of those concretions very nearly approach those of the *third* class, and present no distinct nucleus, being merely an agglutinated mass of vegetable fibres with inspissated mucus and earthy phosphates, sometimes containing other foreign ingredients or accidental ingesta.

8. Other concretions are formed in the intestines of persons who have taken large quantities of magnesia or chalk, with the view of preserving an open state of the bowels, or of correcting acidity in the stomach. The concretions, in these cases, consist of those earthy bodies cemented together by thick mucus. These concretions are, in some instances, merely agglomerated masses; in others, they are indistinctly disposed in layers· they seldom have any proper nucleus, and belong rather to this *third* class, than to any of the foregoing. To this division are also to be referred those concretions which are formed of fæcal matters with earthy phosphates, and inspissated secretions sometimes hardened to the consistence of calculi.

9. *Number*, *Size*, *Colour*, &c. — There are seldom more than two concretions in the intestinal canal, but a greater number is occasionally found. BONET met with nine in the stomach, LANZONI with ten, and BILGUER with thirty in this viscus. The first MONRO detected by the touch twelve concretions in the colon of a boy who was much emaciated; and various authors make mention of as great, as well as of a lower number. The *colour* of the smaller concretions nearly resembles that of iron ochre: the larger concretions are generally externally of a coffee colour, sometimes approaching to purple; and occasionally they have a whitish surface. The different layers often present a slight difference in the deepness of shade. They are sometimes so hard as to admit of an imperfect polish. Some of the calculi have been found extremely large. The first MONRO met with them five, six, seven, and even eight inches in circumference; and the second MONRO removed from the colon of a woman one which weighed four pounds. The larger calculi are generally more irregular in figure than the smaller. This may be owing to the additions made to their surface during the time they remain fixed within a certain portion of the canal. Where more than one are found, they often indent each other, or form, as it were, parts of one long concretion, as in the instance of the very large one, which weighed upwards of twelve ounces, and consisted of three parts, recorded by Mr. TORBET (*Edin. Med. and Surg. Jour.* vol. xxiv. p. 87.).

10. ii. The CAUSES of these *concretions* are, sedentary occupations, inactivity, and indolence; a slow, weak, and torpid state of all the digestive functions; deficient vital energy of the assimilating organs (§ 4, 5, 6.); a long, free, and injudicious use of magnesia, prepared chalk, and other calcareous earths, for the purpose of correcting acidity of the stomach (§ 7.), &c.; portions of the husk and beard of the oat, from living upon oaten bread, &c.; swallowing incautiously fragments of bones, stones of fruit, or seeds; and an habitual neglect of the state of the bowels.

11. iii. Their LOCAL EFFECTS. — When these concretions reach a large size, they interrupt the functions of the intestinal canal, preventing the passage of the fæces, and occasion dilatation of the bowel above the place in which they are lodged, followed by inflammation, ileus, &c. In more favourable cases, they expand the intestines surrounding them into a sac, which in process of time acquires considerable thickness. Dr. MONRO, in his very able chapter on alvine calculi, describes three cases in which the cæcum was extended into the form of a sac, the muscular fibres of which were hypertrophied, and the mucous membrane thickened and corrugated. This sac communicated with the commencement of the colon by a circular opening, which, in one case, was nearly an inch, in another scarcely

above a quarter of an inch, in diameter. A similar sacculated extension has been likewise noticed by this pathologist at the extremity of the ilium, near the cæcum.

12. Owing to the irritation occasioned by these concretions, the intestine is often found constricted around and immediately below them, as demonstrated by SCHENK and MONRO. Adhesion of the concretions to the inner coat of the viscus is a much rarer occurrence. Cases, however, have been observed by HORSTIUS and the first MONRO, where such adhesions existed. Ulceration of the parts in which they are lodged, owing to the irritation occasioned by them, is amongst the most common of the local effects to which they give rise. In some cases, the inflammation induced by them in the internal surface of the bowel extends to the external tunics, until it reaches the peritoneal surface, where coagulable lymph is thrown out, and the convolutions in its vicinity are agglutinated into one mass, or adhesions to adjoining parts take place.

13. iv. The SYMPTOMS which alvine concretions occasion vary extremely, according to their nature, and the size they have attained. Sometimes it seems wonderful, considering their great bulk, that the intestinal canal is not completely obstructed by them. In some cases, they have remained for years, with evident symptoms of their existence. In more fortunate instances, they have been ejected with the contents of the stomach after severe retching and vomiting; or have passed by stool, after severe dysenteric symptoms and tenesmus. In almost every instance, the digestive powers are very much impaired, and the patient becomes, after a time, greatly debilitated and emaciated. The pulse, at first, is but little affected; but the patient complains much of pain and tension in different parts of the intestines, and is subject to occasional attacks of nausea, vomiting, tormina, or purging. The pain in the bowels is usually referred to one part, and is much more severe at one time than at another, particularly after taking acids, or food difficult of digestion. Constipation of several days' duration is often complained of, and yet the patient has a constant inclination to go to stool: at other times, or in other cases, there are frequent watery and scanty evacuations of a viscid ropy mucus or blood, which sometimes give a short relief.

14. When the concretion is of a large size, and the patient is somewhat emaciated, a very hard, painful, globular tumour may be felt in the abdomen, most frequently in the course of the large bowels, upon placing him on his back, and relaxing the abdominal muscles. It can seldom be made to change its place within the intestine, but often appears to do so in consequence of the change of place of the portion of the intestine containing it, particularly when it is lodged in the small intestines, or in the arch of the colon. Some patients are under the necessity of abstaining from solid food, and others reject the greater part of their food. When the concretion has existed for some time, the bowels are generally so much obstructed that laxatives or clysters are necessary to procure a passage. Dr. MONRO states, that when it changes its place, and passes down into the sigmoid flexure of the colon, or into the rectum, it creates excruciating torture in the region of the pelvis and fundament, and the bowels become obstinately constipated, and much distended, from the passage being interrupted.

15. When alvine concretions lodge low in the rectum, they occasion much pain when the patient is sitting, and upon going to stool. When this is the case, an examination *per anum* is requisite, which will lead to their extraction by the forceps. In a case in which the second MONRO was consulted by Mr. GOODSIR, the patient passed, in the course of two or three weeks, nine concretions in this way, some of which were as large as a hen's egg. This patient had laboured for many weeks under very acute pain in the region of the stomach.

16. When the concretions are small, they frequently pass away with the fæcal matter, without occasioning any evident disturbance; the patients, generally, having complained of nothing further than long pre-existing dyspepsia and constipation — the chief causes of their formation. In other cases, especially when they reach a large size, most distressing and urgent symptoms are produced by them; commencing with those already enumerated (§ 13, 14.), and terminating with violent colicky pains, obstinate constipation, pain at the top of the sacrum and loins, or in the hypogastrium, sickness, retchings, and, at last, complete ileus, or all the phenomena of acute enteritis, or peritonitis. Even the smallest concretions occasionally give rise to fatal consequences. Two cases have occurred to me, wherein the most acute peritonitis, followed by the effusion of coagulable lymph, with adhesions, and terminating in sphacelus of the vermicular appendix of the cæcum, was occasioned by these concretions having passed into this part. A similar case is recorded by RUYSCH (*Museum*, 142.).

17. v. TREATMENT. — We are often without any satisfactory proof afforded us, during the life of the patient, of the existence of these concretions in the intestinal canal, the symptoms they occasion being the same with those proceeding from various other causes. Their existence is, therefore, often merely a matter of conjecture, to which the deficient energy of the digestive action, the means resorted to by the patient to palliate dyspeptic symptoms, and his accustomed diet, frequently lead; and we seldom can form any correct diagnosis, unless they are so large as to occasion tumours in the course of the bowels, or are lodged low in the rectum. When their existence is proved by their discharge, we may consider the mischief, in a great measure, if not entirely, removed, unless, indeed, the symptoms continue, when we may infer one of two causes, namely, the presence of more concretions, or the existence of inflammatory action induced by them in a portion of the intestines, or of intus-susception.

18. When the symptoms seem to proceed from the injudicious use of calcareous or magnesian absorbents, these must be entirely avoided. Aperients of a different nature should be employed, particularly the supersulphate of potash, or the sulphate of soda or of magnesia, with the addition of dilute sulphuric acid. In order to relieve the more urgent symptoms, copious injections of an oleaginous, emollient, and purgative kind, should be thrown up. And, in order that

these may more fully answer the intention, they ought to be administered whilst the patient rests upon his knees and elbows, with the pelvis elevated above the shoulders. If vomiting be present, care should be taken not to increase this symptom by the administration of medicines by the mouth. For, by frequently exciting the inverted action of the stomach, this action will extend to the alimentary canal, and terminate in fatal ileus. It is preferable to solicit the action of the bowels by emollient, anodyne, and aperient enemata, and by frictions with oleaginous substances, or fomentations on the abdomen. When we suspect the concretion is owing to the nature of the food, this cause must be avoided. When the concretions are seated low in the rectum, their extraction by the forceps must be tried. Those arising from the use of oat-bread being, generally, partly composed of the earthy phosphates, and considering the solubility of these salts, Mr. Torbet and Dr. Duncan conceive that an impression might be made on them by a course of mineral acids taken by the mouth, or injected by the anus.

19. The second Monro recommends, in cases where the concretion is evident to the touch, forming a distinct and fixed tumour in the bowels, and where the symptoms are urgent, all other means having failed, to attempt its extraction by an incision through the abdominal parietes into the intestine; and in this recommendation Mr. Torbet and Dr. Duncan agree. But, before resorting to this last means, Dr. Monro advises the following very judicious plan, which I extract from the very excellent materials which his son has laid before the profession: — "1st, Let the patient (a female) take every day a quarter of an ounce (?) of Castile soap, in pills, and of castor oil. 2d, Once or twice a week, let her take a purgative composed of sal glauberi, ʒj., sugar half an ounce, and the same of salad oil, and whey ℔ss., or ℔j. 3d, Three times a week let her get a clyster of a quart of water, in which an ounce of linseed and half an ounce of Castile soap have been infused for two hours. 4th, Let her foment the belly, and take the above clyster, when she suffers much pain. Let her diet consist of loaf-bread, milk, whey, broth, soft eggs, butter, a bit of light-dressed meat; and if she take porridge, let her melt a good deal of butter in it." (p. 50.) Such was the advice of a most experienced physician in this description of disease; and it proved successful in the case for which it was directed. (See also the *Treatment* of Colic and Ileus, and of Constipation.)

20. II. Fatty and Heterogeneous Concretions. — *A. Concrete substances*, differing very materially from those already described, are sometimes formed in the alimentary canal, particularly in the large intestines. These are usually derived from two principal sources, viz. a morbid state of the secretions poured into the intestinal tube, or secreted from their internal surface; and alterations of the usual state of the fæcal matters, during their retention in the cæcum and large bowels. To these, a third may be added,—the ingestion of substances into the stomach, which are incapable of undergoing any material change during their passage through the canal, excepting their agglutination into firm balls.

21. *B. Concretions* of an *oleaginous* nature, or varying from an oleaginous to an *adipocirous* or even *waxy* character, are sometimes voided by persons who suffer from a torpid state of the bowels, and deficient digestive function. These concretions are often mistaken for gall-stones, but are readily distinguished from them by the following characters: — They are generally of a globular form, vary in size from that of a small pea to the bulk of a large grape, are of a cream colour, slightly translucent, and of sufficient consistence to preserve their form and be cut with a knife, like soft wax.

22. These unctuous concretions cannot in general be traced to any oleaginous material introduced into the stomach; yet there is sometimes evidence furnished of their origin in oleaginous or fatty substances which have not undergone the requisite changes in the prima via, but have been merely slightly changed by the acid existing in the stomach, and by the secretions poured into the alimentary canal, so as to assume the appearances now described. It is possible, however, that they may be occasionally formed by intestinal secretion, or by a chemical change effected on parts of the recrement of the food, after having passed into the cæcum and colon. Fat, either in the concrete form now described, or in a state of fluidity and purity resembling oil, has been occasionally, although rarely, voided from the bowels, independently of having been taken by the mouth; although more frequently proceeding from the latter source; as instances observed in the course of practice at the Institution for Children have proved. Cases of this description have been recorded by Dr. W. Scott (*Ed. Med. Comment.* vol. iv. p. 334.), Dr. Babington and Dr. Elliotson (*Philos. Trans.* 1813, art. xxi.), Dr. Kuntzmanz, of Berlin (*Journ. der Pract. Heilkunde, July,* 1821.), Dietrick, and several others.

23. Sir Everard Home endeavours to account for the production of these adipocirous and fatty concretions, by contending that it is the office of the large intestines, particularly of the colon, to convert a considerable portion of the matters poured into them into fat, by combining them with the bile; and the fat thus formed in the large intestines is taken up and conveyed into the circulation, to be deposited in various parts of the body, to supply the wants of the economy. But the production of fat in the intestines seems to be only the result of a diseased action, inasmuch as it is voided from them, in any of its states, only during disease — during visceral complaints, and colicky or dysenteric affections — and is never observed to be passed from, nor is found within, these viscera, when they are in their healthy condition. It appears from the history of the cases on record, as well as from those recently observed by Dr. Elliotson and Mr. Lloyd, to be especially connected with disease of the assimilating viscera, and consequently with imperfect assimilation; a portion of the chyle, instead of being changed to healthy blood, assuming an oleaginous state, as not infrequently observed in the serum. The fatty matter thus accumulated in the blood, will, in several states of disease, be eliminated from it by excreting organs — particularly by the mucous surface of the bowels, and by the liver and kidneys — instead of being deposited in the adipose tissue for ulterior purposes, and

will assume either a concrete or fluid form, owing to modifications of its state as originally secreted, or to the action of other matters upon it during its retention in the bowels or urinary bladder.

24. A singular case has been recorded by Dr. Kennedy (*Medico-Chirurgical Journal for Sept.* 1817.), of an intestinal concretion, which was found, upon its analysis by Dr. Ure, to be similar in its composition to ambergrise.

25. *C.* Intestinal concretions have been found to consist entirely of those matters which have been swallowed from either a depraved appetite, or bad habit; thus, concretions causing violent symptoms, have been produced by the habit of chewing the ends of threads used in sewing, and which have formed a firm felt with the mucus of the intestines and some fæcal matters. I was lately consulted in the case of a young lady who had been long under treatment for obscure abdominal disease, respecting the nature of which no two of the several eminent practitioners who had been in attendance agreed. The existence of accumulated matters in the cæcum and colon seemed evident to me, upon examination, and from the character of the constitutional and other symptoms. Purgatives and injections were long persisted in; at last several concretions — (about twelve) — from the size of a filbert to that of a walnut, were evacuated. Upon examination, they presented a substance resembling pasteboard, with a fæcal smell, of a brown colour, and containing earthy particles. On being broken down and macerated, they were found to consist chiefly of coarse paper reduced to a pulpy state, but containing fragments not materially altered. The portions of pulpy paper were agglutinated with mucus, portions of fæces, and a little phosphate of lime. After some time the patient confessed that she had occasionally been in the habit, about the age of thirteen and fourteen, of chewing, and sometimes swallowing, portions of the grey paper with which she curled her hair. After the evacuation of these concretions, all the symptoms disappeared, and she rapidly recovered. A few years ago, I attended, with Mr. Annesley, a similar case to the foregoing, but in a younger lady. She recovered perfectly by the use of purgatives and clysters.

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CONGESTION OF BLOOD.

Classif. General Pathology: and I. Class, IV. Order (*Author*, in *Preface*).

1. Defin. *Deficient vital tone or power, chiefly of the capillary vessels and veins, occasioning accumulation of blood in them, and a languid or more or less retarded circulation, the functions of the organ or part being thereby proportionately disordered.*

2. 1. Nature and Relations of Congestion. — It has been stated in other places (see arts. Blood, Disease.) that morbid states of the vascular system, and of the fluid circulating through it, must be imputed, in a large proportion of cases, to changes induced primarily in the organic nervous system, which is, anatomically, most intimately connected, not only with the circulating system, but also with the organs essentially vital; this connection subsisting by ramifications proceeding to them both directly and obviously either from the great central ganglion or from appropriate subordinate ganglia, as well as indirectly and less apparently through the medium of the blood-vessels, on which the organic nervous system is every where profusely distributed, the one accompanying the other throughout the frame. Thus intimately interwoven, they experience reciprocative changes, and generate a common influence. The vital organs, as well as their subordinate parts, in the more perfect animals, being supplied by both these systems, — the most rudimental type and essential requisites of organisation, — and actuated by their common influence, are thereby enabled to perform their destined functions; the superadded or peculiar organisation of each organ being the instrument, which, thus actuated, performs specific offices in the economy.

3. It results from this, — 1st, that we are not justified in considering changes in the states of vascular action, or in the relation subsisting between the vessels and the quantity or quality of the fluids circulating in them, apart from the condition of the organic nervous system, which is thus intimately connected, by structure and function, both with them and with all vital organs; 2d, that changes in the vascular system are very often induced by impressions made primarily upon the organic nervous system; whilst, on the other hand, a morbid state of the former, particularly in respect of its circulating contents, will most seriously affect the latter; and 3d, that, upon tracing the procession of morbid phenomena, the first impression made by the exciting cause, and earliest change from the healthy state, will be found in the functions of this system of nerves, in perhaps the larger proportion of cases; vascular action, &c., and the secreting and assimilating functions, being very soon afterwards disordered. The truth of these propositions will become more manifest after having surveyed the causes which induce congestion, the phenomena which accompany it either as coincidences or consequences, and the results to which it leads; and we shall be more fully convinced of the propriety of viewing it as very much more frequently a link merely in the chain of morbid action, than as a primary or even an early change.

4. Congestion has been divided by many modern pathologists into *active* and *passive*, they understanding by the former that state of vascular action which coincides with *active determination of blood*, according to the meaning I have attached to it in another article. (See Blood, § 25.) It may be defined to be a vital excitement with somewhat of expansion of the vessels, and the circulation of a larger quantity of blood through

them, without any obvious tendency to form new productions, or to occasion disorganisation, unless inflammation, or some other morbid condition, supervene, which is very often the case. From this state — *active congestion* (see Blood, § 26.) — in which the vital action of the vessels is above their healthy standard, there is every intermediate grade, lapsing insensibly into extreme *passive congestion*, in which there is deficient or depressed vital power, the current of the circulation through the weakened vessels being remarkably languid and retarded. In this state, the venous and arterial capillaries, having lost the principal part of their tone or vital tension, re-act imperfectly upon the mass of blood injected into them by the heart's action, and become distended and *congested*. This state, then, existing in any degree, down to that which is barely compatible with the continuance of the life of the part, constitutes congestion; it being thus considered as a state of sub-action, and not of super-action, as determination of blood undoubtedly is.

5. i. In respect of *the modes of accession* by which congestion presents itself, much diversity exists. It may occur suddenly, after intense causes; slowly, after slight influences or other disease; and almost insensibly, after active determinations of blood and inflammatory action. It may be almost the primary lesion, the impression made by the exciting cause upon the organic nerves being the only previous change; or it may be one of the most remote, and only antecedent of, or immediately consequent upon, dissolution. It is generally the result of directly or indirectly depressing causes; and assumes every grade according to the intensity of their operation relatively to the organic nervous or vital energies of the frame on which they act.

6. ii. *The textures most liable to undergo congestion* are such as, owing to their conformation, particularly the laxity of their vital and physical cohesion, admit of the distension of their vessels. Cellular parts, and organs in which the cellular structure predominates, as the parenchyma of various internal organs, particularly the brain, the lungs, the liver, spleen, and kidneys; the mucous membranes, especially those of the bronchi and digestive canal, and the uterus and ovaria; are most liable to experience this state of their blood-vessels. Besides these, however, other and less yielding structures, as the serous and fibrous membranes, the skin, the muscles, &c., may be congested to a certain extent, particularly after exhaustion of the vital energies of the frame, and diminution of the vital cohesion of these structures, either by causes which depress the organic nervous power, or by noxious agents contaminating the blood, or by over excitement of the vascular system of the congested part, or of the whole frame. In one or other of these three ways, congestion supervenes when it is observed at the commencement, in the course, or towards the close, of febrile and constitutional maladies; the same causes, and operating in a similar manner, also occasioning congestion of those viscera which are most liable to it by conformation.

7. iii. *The causes of congestion* are, therefore, 1st, those which act by primarily depressing the organic nervous influence; such as advanced age; the continued or prolonged impression of cold, mental anxiety, and all the depressing passions and moral emotions; prolonged sleep, mental and physical inactivity; miasmal, contagious, or infectious emanations; various vegetable, animal, and gaseous poisons; and the rapid loss of the natural electrical tension of the frame: 2d, those which mechanically impede the return or circulation of the blood itself, or which change its quantity and quality, either locally or generally; as excessive heat; general plethora, produced either by too full living, or by the suppression of the natural or accustomed discharges, interrupted circulation through the heart, the lungs, liver, &c.; a long retained posture by debilitated persons; the use of unnecessary ligatures and tight lacing; improper and unwholesome food; contamination of the blood, by the absorption or introduction into it of noxious mineral, vegetable, and animal substances, or gaseous fluids; and changes taking place in its constitution, from the interrupted secretion and elimination of hurtful matters from it (see Blood, § 115. *et seq.*)—these latter causes affecting the vital manifestation of the vessels and nervous systems: 3d, those causes which exhaust the irritability or vital tone of the vessels, by previously exciting them above their natural state of action; as local determinations of blood, general vascular excitement; fatigue from violent or continued exertion; pre-existing fever, inflammation, or other diseases. Thus it will be seen that congestion arises from changes induced (*a*) in the state of organic nervous power, and externally to the vessels; (*b*) in the blood itself, and acting internally on the vessels and structures; (*c*) in the coats of the vessels themselves; and (*d*) in two or more of these simultaneously.

8. iv. The *symptoms* indicating the existence of congestion are sometimes very apparent, at other times very obscure. When it is present in a marked degree, and in vital organs, the disturbance of function is usually so great as to indicate its existence; but even then the kind of disturbance may be very nearly the same as proceeds from morbid states, which we shall hereafter find congestion not infrequently occasions, viz. sanguineous or serous effusion; as in the cases of intense congestion of the encephalon. Upon the whole, however, it gives rise to partial loss, or entire abolition, of the functions of the affected part. Thus, congestion of the brain, when moderate, will occasion a slight state of lethargy, or vertigo, &c.; where more severe, epilepsy, coma, or apoplexy. Congestion of the liver is attended by more or less complete arrest of the biliary secretion, with tumefaction of the organ, &c.; and congestion of the bronchial surface and lungs, with dyspnœa, asthma, &c. Febrile phenomena seldom accompany congestion, unless it arise in the course, or towards the close, of febrile diseases, or be excited by infectious or miasmal emanations, or is about to pass into an inflammatory or hæmorrhagic state. When it occurs in large secreting viscera or surfaces, the function of secretion is either impeded, vitiated, or altogether suspended; a return or increase of the secreting action either restoring the healthy state of circulation, or converting it into active determination, or even into inflammation. When congestion affects several parts, or two or more important viscera, as on the invasion or towards the close of malignant fevers, or when the circu-

lating fluid and soft solids become contaminated, the functions of the economy are very gravely disturbed, and some of them almost annihilated: in such cases, the morbid impression made by the existing causes upon the organic nervous system, disorders the various functions it actuates, and even puts a stop to some of them; the derangement of function being often a coeval and coordinate effect with the congestion. Hence the arrest or diminution of function becomes one of the most common indications of the extent of congestion, even although it may not be the actual consequence of this state of the vessels.

9. v. The *appearances presented by congested parts* after death vary extremely with their structure, and the degree and duration of the congestion. In addition to more or less engorgement of the small vessels and veins, there are generally found a darker colour of the contained fluid than in the natural state, considerable tumefaction, and diminished cohesion of the affected structure, and alteration of its colour. The change of colour may be of various grades of deepness, to a brownish or greenish black, as frequently observed in the liver and spleen; and the loss of vital cohesion may be very remarkable, as in the same viscera, tumefaction being then very considerable. These appearances are often accompanied with effusion of a serous, aqueous, or sanguineous fluid from the congested surfaces; and sometimes with ecchymoses of a deep colour in or beneath the mucous tissues, and occasionally in serous membranes and parenchymatous parts.

10. vi. The *general consequences and terminations* of congestion are deserving strict attention, as to this state are to be imputed several of those more grave and dangerous changes presented to us in the advanced stages of numerous diseases. 1st, Congestion terminates in the restoration of the healthy circulation. This is most frequently the case in respect of secreting parts, as the mucous and villous surfaces and glandular organs; the return of their secreting functions aiding most materially the restorative process, by diminishing the fulness of the vessels, and soliciting an accelerated circulation through them. Hence, although a restoration of the circulation, to some extent at least, is often antecedent of the return of the secreting function, yet we frequently succeed in restoring the former by exciting the latter; the stimulus thus imparted extending itself to the weakened and congested vessels. Parts which have once suffered congestion in a very marked degree, very often retain a disposition to experience it again, upon exposure to its causes; this disposition, however, diminishing with the lapse of time, if judicious means of strengthening the organ be adopted. 2d, Congestion may pass into active determination, or into inflammation of various grades of intensity. This may arise from changes induced in the state of the blood itself relatively to that of the vessels; or from the re-action of the vessels upon the distending fluid, and the augmented impulse following the temporary retardation of the circulating current; or from the use of irritating and inappropriate stimulants in order to remove the congestion; or from inordinate excitation of the secreting functions, when we endeavour in this way to remove oppletion of the vessels. 3d, Congestion frequently occasions serous or aqueous effusions in the vicinity of the congested organ, or in the areolæ of its cellular tissue. We often observe this termination in the different internal viscera, and cavities in which they are situated. It evidently depends upon the rarefaction of structure occasioned by distension of the parietes, and loss of tone of the congested vessels, most probably assisted by weakened vital cohesion of the tissues, and diminished crasis of the blood; these conditions either accompanying or following the congested state, which very frequently is partially, or altogether removed by the consequent effusion. 4th, Hæmorrhage may supervene, either from the surface, or into the substance of the congested organ or part; owing either to a constitutional disposition to hæmorrhage, arising from original conformation, the vessels readily yielding from distension or accidental impulse; or to the existence in a more or less intense degree of the same changes which produce aqueous effusion, particularly weakened cohesion of the tissues, and, consequently, of the delicate canals conveying the blood through them, and a morbid state of the blood itself. 5th, Congestion of the minute capillary canals, either frequently recurring, or continuing long, seems to give rise to various morbid or adventitious structures, particularly when it takes place in persons of a scrofulous diathesis, or affected by any other constitutional taint. In such cases there is a marked indisposition, both of the part to return to a healthy state, and of the adventitious structure to be absorbed. 6th, Retardation of the circulation in congested vessels may be so complete as to occasion even loss of vitality and gangrene of the part. We observe this in the congestion arising from extreme cold, from the exhaustion consequent on intense excitement, &c.

11. vii. *Congestion, and its consequences in respect of particular structures*, are of great importance, and are therefore considered among the principal changes to which vital organs are subject. Although the local relations of congestion fall under their appropriate heads, it may be remarked, in general terms, that congestion may occur in any structure or organ during life, without evincing upon dissection unequivocal proofs of having ever existed; and that it may apparently continue till dissolution, without being very manifest upon examination afterwards. Such is especially the case in respect of congestion of mucous and serous surfaces, the vessels of which empty themselves soon after death, when the propelling power no longer acts upon them and distends their relaxed parietes, in consequence either of the passage of more or less of their contents into the adjoining veins, or of the escape, through the extreme canals and pores of these structures, of the more aqueous or serous parts of the blood they contained, or of both these changes conjoined. From this it will be manifest that many cases of recent or not very intense congestion, wherein we have reason to infer that the small vessels have not altogether lost their vital tone, particularly of membranous parts, will present upon dissection chiefly fulness of the veins, proceeding from these parts, with the effusion of more or less of a serous, aqueous, or sanguineous fluid in their vicinity. On the other hand, congestion of internal organs may not have been detected at all during life, or it may have occurred

but shortly before, or at the time of death, and yet be very evident upon inspection afterwards. This is not infrequently observed in respect of parenchymatous organs and mucous and villous surfaces. When congestion, however, occurs in the large viscera, as the brain, lungs, liver, and spleen, and continues up to the time of dissolution, it is generally very manifest in them upon dissection. In many diseases, particularly those in which the blood becomes affected previously to, or continues fluid after, death, and in those which terminate by asphyxy, congestion of depending parts is a very common *post mortem* occurrence, and one which should be carefully distinguished from the congestion that has existed during life.

12. II. Of the Treatment of Congestions.— i. It is necessary always to keep in view the fact, that congestion is a consecutive lesion, arising generally from causes which depress the vital manifestation of the organic system of nerves supplying the blood-vessels; and that, although it is very frequently associated with general plethora, and necessarily implies the existence of local plethora (see Blood, § 23.), yet, on account of this depression of nervous power, *general depletion*, unless to a small amount, is seldom of much service in the treatment of congestion, unless it be conjoined with the use of stimulants, derivatives, and excitants of the secreting functions. *a*. But *local depletions*, particularly when directed in such a manner as to operate some degree of revulsion from the congested part, sometimes carried to a considerable extent, or repeated as circumstances require, are among the most requisite means of cure. *b*. When the powers of life are much reduced, even local depletions should be employed with caution, and never without having recourse, at the same time, or previously, to suitable *excitants* and external *derivatives*. Of these classes of remedies, the most preferable are such as tend to equalise the circulation throughout the viscera, and determine it to the periphery of the frame. *Diaphoretics*; the *warm* or *vapour bath*; warm poultices and fomentations; *rubefacient embrocations*, epithems or poultices, especially those with Cayenne pepper, mustard, horseradish, &c.; *blisters*, and warm and rubefacient *pediluvia*; are calculated to accomplish these purposes. *c*. Much advantage will also accrue from attempting to restore, by *emetics*, *purgatives*, or other remedies, the secretions of the mucous surfaces, and the functions of the congested organ; as the restoration of these functions, which are generally impeded or altogether arrested, will unload the vessels, and accelerate the retarded circulation in them. But it should be kept in mind, that the medicines that operate in this manner are generally local and specific excitants; and hence that they, as well as the stimulants usually given internally, should be exhibited with caution, and preferably at the same time that local depletion, with *derivation* to the surface of the body and lower extremities, are being employed. Without attention to these precautions, we may convert, particularly in plethoric persons, simple congestion into active determination of blood, or into inflammation. *d*. The *diffusible stimulants* that are generally most serviceable in removing congestions are, camphor, the preparations of ammonia, the æthers, weak infusions of arnica or serpentaria, warm diluents with saline medicines or the nitro-muriatic acids, the liquor ammoniæ acetatis, small doses of ipecacuanha, with camphor and opium, &c., and several of the gum-resins and essential oils. *e*. In many cases of congestion of vital organs, it will be requisite, in addition to the foregoing measures, to direct internal *revulsant agents* to remote viscera. Thus, in congestion of the head or lungs, we shall derive advantage from exciting the action of the lower bowels by *irritating cathartics* and injections; and, having prescribed depletions and external derivation, from a judicious employment of active *diuretics*. *f*. In all cases, it will be necessary to promote the natural secretions and excretions; inasmuch as we thereby keep up a regular distribution of the circulating fluids, and eliminate from them such hurtful substances as might irritate the vessels and induce consecutive disease, if they were allowed to accumulate. *g*. In many instances, benefit will accrue from the *affusion* or *aspersion of cold or tepid water* over the part enclosing the congested organ, especially when the state of the pulse, and the seat of congestion, lead us to dread the supervention of hæmorrhage, as in congestion of the brain or of the lungs. *h*. Besides the external means already alluded to, various others may be employed near the seat of congestion; as *moxas*, the actual *cautery*, dry cupping, stimulating or rubefacient *liniments*, dry friction, the warm and tepid affusion or *douche*, the nitro-muriatic acid lotion, chlorine or fumigating baths, electricity or galvanism; but these are most appropriate to the more chronic states of congestion. There are other remedies besides the few now adduced, which are suitable to particular states and seats of congestion, and which fall under different heads.

13. ii. Having removed the congestion, it will be necessary to employ means to prevent its recurrence, for the part once thus affected long retains a morbid disposition. This object can be obtained only by a careful avoidance of the exciting causes — by preserving a free state of the secretions and excretions — by promoting the digestive functions, and invigorating the system by moderate exercise in the open air, either on foot or horseback — by the use of mineral waters, particularly those which combine a tonic with an aperient and deobstruent operation, as the waters of Cheltenham, Harrogate, Scarborough, Leamington, Seidschutz, Carlsbad, Bath, Marienbad, Vichy, and Eger — by warm clothing, and by guarding against general vascular plethora.

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CONSTIPATION.— Syn. *Constipatio vel Obstipatio Alvi; Alvus tarda, dura, adstricta,* Var. Auct. *Tarda Alvi Dejectio,* Vogel. *Obstipatio Alvina,* Young. *Stypsis* (from στύφω, I constringe) Ploucquet. *Coprostasis,* Good. *Hartleibigkeit,* Germ. *Constipation, Paresse du Ventre, Fr. Costipazione,* Ital. *Bound-Belly, Costiveness, Obstipation, Fæcal Retention, Alvine Obstruction.*

Classif.— 4. *Class,* Local Diseases; 5. *Order,* Obstructions (*Cullen*). 1. *Class,* Digestive Diseases; 1. *Order,* Affecting the Alimentary Canal (*Good*). I. Class, I. Order (*Author*).

1. Defin. *Prolonged retention of the fæces; or slow, imperfect, or difficult evacuation of them.*

2. Dr. Good has made Coprostasis, or Costiveness, a genus, and divided it into *C. Constipata,* and *C. Obstipata;* the chief difference being, that the evacuation is voluminous in the former, and scybalous or slender in the latter. This division is nearly the same as that previously adopted by Dr. Bateman, viz. into Costiveness and Constipation. I believe, however, that any distinction between them is quite unnecessary; inasmuch as either the one or the other, even according to the import these writers attach to them respectively, may arise from exactly the same pathological conditions; and that it will be better to employ these terms in their usual acceptation, and to make constipation an intermediate grade between costiveness and obstipation; or, if any other difference than that of degree be imputed to them, to consider obstipation as a modification merely of the others, by attaching to it the idea of difficult and imperfect voidance of the fæces, as well as of prolonged retention of them — which latter alone will apply to costiveness and constipation, according to the degree of obstinacy by which the retention may be characterised.

3. The slighter grade, or costiveness, can scarcely be considered as a disease in some constitutions, as it is often attended by a good state of health in other respects, and seldom continues so long as to occasion any appreciable disturbance. But, when neglected, it gives rise to those collections in, and morbid conditions of, the *colon,* which have been described in that article, and favours the occurrence of other maladies. Although cases are frequently occurring in which little disorder results from constipation, except from the means used to remove it, yet very serious or even fatal effects not infrequently accrue from it. I shall, therefore, adopt the opinion of Cullen, and consider the retention of the fæces beyond twenty-four hours, without the desire of evacuation, as an approach to a morbid state, and therefore requiring medical aid.

4. *Duration, &c.*— The annals of medicine abound with cases in which the fæces had been retained for an almost incredible time, without any serious or severe symptom supervening. The occurrence of constipation for several days, or even weeks, is not rare, particularly in some constitutions, and in weak or delicate females, who take little nourishment, and as little exercise; and, excepting listlessness with debility, little disorder is complained of. It is not uncommon to meet with cases, especially in this sex, where extremely little food is taken, and where the fæcal evacuations are not more frequent than once a week, or once a fortnight or three weeks; eliminations of effæte matters from the blood taking place chiefly by means of the skin, the surface of the lungs and kidneys, and generally in an insensible manner. But cases also more rarely occur, where the retention is much longer, even without any other symptom than great flatulent and fæcal distension, particularly of the colon, until, suddenly, symptoms of colic, ileus, or inflammation, come on, and soon terminate the life of the patient, or put it in extreme jeopardy. Instances have been adduced by Rhodius, Panarolus, Salmuth, Devilliers, Blankard, Erhard, Mossman, &c., of constipation continuing for five, six, or seven weeks, and even for as many months, without any fæcal evacuation. Dr. Baillie published a case which continued for fifteen weeks; and Joerdens met with cases of fourteen, fifteen, and twenty-one weeks. Instances of constipation continuing three, four, five, seven, eight, and nine months, have been detailed respectively by Triœn, Chaptal, Smetius, Staniland, Pomma, Crampton, and Valentin. In many of those very prolonged cases, the appetite was very deficient; but in that adduced by Mr. Staniland, which continued for seven months, the appetite continued good until inflammation, which rapidly terminated life, came on. This person, a young female, never had more than one evacuation every two months, during a period of five years; all which time she appeared otherwise in good health. Indeed, in some instances of less duration than those now alluded to, the appetite has been much greater than in health. I have met with several cases of habitual constipation, in which the patient had a ravenous appetite, and yet did not pass a fæcal evacuation oftener than once every four, six, eight, or ten days; but, in almost every such instance, either the breath has been loaded with an offensive vapour, or the perspiration has been abundant and disagreeable, or the urine copious and much loaded,— evidently proving that the disorder was connected with a rapid absorption from the alimentary canal, and augmented evacuation by the other excreting surfaces, or by the kidneys. The inordinate excretion that takes place by this latter emunctory, and the constipation, and ravenous appetite accompanying it, in diabetes, further shows that a very large proportion — sometimes nearly all — of the ingesta will sometimes be so far digested as to admit of their absorption, their subsequent discharge taking place almost exclusively by the skin, lungs, and kidneys; a proportionate diminution of the excreting functions of the bowels, and consequently of fæcal matters in them, being the result; that portion, however, which does collect, being retained until it excites them to action, either by the bulk or by the irritating properties it may have acquired, when also it may be the cause of a morbid or perverted action. The above circumstance shows (what, indeed, physiological research has proved), that, in healthy persons, the principal part of the fæcal discharges consists of secreted matters, and but a small portion of them of such parts of the food as have escaped the changes produced by digestion; and it proves the accuracy of the opinion entertained by Cullen, at least as respects a

large number of such cases, viz. that costiveness arises, in great measure, from the absorption of the more fluid parts of the contents of the bowels, whether consisting of the digested aliments, or of the exhaled or secreted fluids poured into them.

5. I. Causes.—i. *Remote causes.* Habitual costiveness is most common in persons of the melancholic temperament, of a thin and robust habit of body, and of a rigid constitution of fibre; and is often connected with great activity of the absorbent function. The most prolonged cases of constipation usually occur in thin delicate females, and is obviously owing to an asthenic condition of the organic functions, particularly those more intimately connected with the alimentary canal. Meckel states, that cretins are very generally constipated, partly owing to their inactive existence. It is very often caused by the use of indigestible food, as heavy, or imperfectly leavened, or adulterated bread, new cheese, nuts, cucumber, &c.; by stimulant and astringent aliments and beverages; by the use of narcotics; by smoking or taking snuff; travelling in carriages or on ship-board; by sedentary occupations; too long indulgence in sleep, and too warm beds; inattention to the first intimation to alvine evacuation; venereal excesses; prolonged lactation; excessive perspirations, or increased exhalation and secretion from other surfaces and parts than the intestinal canal; mental or physical exertions too long continued; advanced age; pregnancy; and the various mechanical and organic causes about to be noticed (§ 9. *et seq.*).

6. ii. The *immediate causes*, or *pathological states giving rise to the retention* and imperfect excretion of the fæces, appear to be the following:—1st, Impaired or *torpid functions* of the *duodenum* and *small intestine*. (See Duodenum.) In this form of disorder, more or less obvious symptoms of indigestion are usually complained of from two to four hours after a meal, and it is often attended by a slow pulse, slight sallowness of the countenance and skin, with distention or uneasiness about the right hypochondrium, and, in some cases, with a dull pain in this situation, and unnatural heat of the palms of the hand and soles of the feet. The tongue is foul at the root, while the sides and point are red; the urine high-coloured, or depositing much sediment, and the pulse sometimes slower than natural; but occasionally quicker a few hours after a meal. 2d, *Torpid function* of the large bowels, affecting either the *cæcum*, *colon*, or *rectum*, in a more or less special manner. In this form of disorder, constipation is usually more prolonged than in the foregoing, and the sense of distension or uneasiness is referred to the situation of these viscera. There is also much flatulence, and all the symptoms more particularly noticed in the article on *Torpor of the* Colon.

7. Constipation may thus arise from an inactive state of any part of the alimentary canal, but it most frequently and immediately depends upon torpor of the portion devoted to the function of fæcation; and, although a part only of the digestive tube may be chiefly affected, yet disorder is seldom limited to it,—the functions of the adjoining portions, and, in many cases, of the whole canal, being impaired. It may be useful, also, to endeavour to estimate in what this disordered function may consist, and whence it proceeds; and although nothing beyond conjecture will often be advanced, yet will our opinions very often be well founded, particularly after repeated observation, and the attempt will therefore become advantageous in practice. Impaired function, then, of any part, or even of the whole, of the intestinal canal, producing either habitual costiveness, or the occurrence of prolonged constipation may be owing to one or more of the following states:—*a.* To a diminished secretion, or modified condition of the biliary and pancreatic fluids; *b.* To lessened exhalation from the mucous coat of the intestines, and to impaired secretion from the follicular glands of this membrane; *c.* To a rapid absorption from the internal surface of the bowels; *d.* To relaxation, or torpor of the muscular coats of the intestines giving rise to distension, followed by imperfect or irregular re-action on the distending power, and consequent fæcal and flatulent accumulations, particularly in the large bowels; *e.* To rigidity of the longitudinal bands of the colon, forming this viscus into cells, and diminishing the calibre of the central canal, from each side of which the cells diverge,—thereby occasioning that state of constipation or obstipation, which is characterised by scybalous stools, and a difficult and imperfect evacuation of them; *f.* To the production and accumulation of flatus in the intestinal tube, which, by the distension and inaction of the coats it occasions, as well as by its mechanical effects in obstructing the passage of the fæces, and impacting them into masses, often proves no mean obstacle to the regular process of fæcation; *g.* To the accumulation of mucous sordes on the surface of the intestines, or the lodgment of hardened fæces in the cæcum, cells of the colon, or rectum; and, lastly, To a varied combination of two or more of the above states of function. All these may be resolved into, or referred to, one morbid condition, viz. impaired organic nervous power, or diminished vital manifestation of the digestive canal, expressed in one or more of the above modes, or occasioning these pathological conditions.

8. The above may constitute *primary* or *idiopathic* constipation, or intestinal indigestion; or, in other words, functional impairment of the defæcating process. But constipation is as frequently *consecutive* of lesions, either (*a*) of the structure of the coats of the bowels themselves, and affecting the calibre of their canal; (*b*) or of adjoining parts, causing obstruction, compression, or displacement of them; (*c*) and it is also very often sympathetic of other diseases, which derive from them some portion of the vital action requisite to the regular performance of their functions. The last of these requires no further notice, as it resolves itself into the pathological states above enumerated; but it is very important that the practitioner should be enabled to recall to his recollection the various changes which not infrequently do occur, and give rise to the same state of disorder as the functional derangements above stated; as, upon a recognition of their presence or of their absence, the prognosis and treatment will very materially depend. The enumeration of these will also comprise all that has been found upon the dissection of such cases as have terminated fatally, fuller details respecting them

being given in other articles, particularly in that upon the *Organic Lesions of the* Digestive Canal.

9. *A. Lesions, chiefly of structure, affecting the bowels and retarding the defæcating processes.* — *a.* Extreme dilatation of one or all of the large bowels, sometimes independently of much fæcal accumulation; but most commonly accompanied with large collections of hardened fæces and gases (Stœrck, Brendel, Callisen, Abercrombie, Staniland, and many others). In cases of this description, the cæcum and colon have frequently been observed from twenty to thirty inches in circumference. *b.* Scybala, hard bodies, particularly biliary or intestinal concretions, the stones of fruit, &c., in various parts of the intestines, especially in the cæcum or before its valve, the sigmoid flexure of the colon, and in the rectum just above the sphincter, and pressing upon it and the prostate. Instances of prolonged constipation have occurred in my practice from the obstruction occasioned by large balls of lumbrici and ascarides. A singular case of this description was noticed by me in the *London Medical Repository* (vol. xvii. p. 243.), and similar effects have been mentioned by Lieutaud, Brera, Renauldin, and Bremser. *c.* Of inflammation of an insidious character, and subacute or chronic form, affecting chiefly the muscular or peritoneal coats of some part of the bowels, particularly of the small intestines; and either altogether arresting the peristaltic and tonic movements of that part, or greatly diminishing their activity. *d.* Contractions of various parts of the intestinal tube, but most frequently of the rectum, next of the colon, and least frequently of the cæcum and small intestines: these may be small in extent, although great in degree; or they may be the reverse. The narrowed part may be affected by spasm, or by thickening of one or more of its coats; this latter change being either so limited as to have the form of a ring (Home, Baillie); or extended much wider, and seated in a large portion of the bowel, or in more than one part. It may, moreover, be ulcerated, callous, cartilaginous, scirrhous, or even carcinomatous, &c., and it is always attended by great distension of, and fæcal accumulations in, the part above it (Morgagni, Lorry, Stoll, Baillie, Portal, Howship, Calvert, Annesley, &c.). *e.* Hæmorrhoidal tumours, either in a state of inflammation or irritation, and fissures, &c. of the anus, will often occasion constipation: the latter, by rendering the sphincter of the anus irritable and spasmodically contracted, so as to oppose the expulsion of the fæces retained in the bowel; the former, by producing the same effect upon the sphincter, as well as by presenting a mechanical obstacle when seated internally. *f.* Constriction, or contraction, of a portion of intestine by adhesions or by cicatrisation (Theden). *g.* Polypous, fungous, or fleshy excrescences growing from the inner surface of the cæcum, colon, or rectum; polypi of the sigmoid flexure of the colon passing down into the rectum (Portal, Meckel, &c.); sarcomatous tumours, and scirrhous and carcinomatous productions in the rectum or colon, are irremediable causes of obstruction when they reach a certain extent, and occasion great, and sometimes enormous distension of the parts immediately above them, with fæcal accumulations*, &c.

10. *B.* Constipation is also not infrequently the consequence of *diseases seated exteriorly to the coats of the intestines, and compressing or displacing them,* and of which the following are the most remarkable: — *a.* Tubal or extra-uterine fœtation, pregnancy, hernia, &c. *b.* Pressure on the rectum, arising from luxation or fracture of the os coccygis (*Ephem. Nat. Curios.* dec. iii. ann. v. and vi. ob. 241.). *c.* The pressure of tumours in the uterus or ovaria; prolapsed or retroverted uterus (Hunter, Wedel, Schultz, Marsinna, and myself). *d.* Various tumours seated between the uterus, vagina, and rectum (Bader, Bonet, Burggrave); abscess in the same situation (*Ephem. Nat. Curios.* dec. i. ann. iii. ob. 167., and myself); and too large a pessus in the vagina (Bayard). *e.* Abscess between the bladder and rectum (Conradi, Leske, &c.); and enlargement or other disease of the prostate (Ford, myself, and others). *f.* The pressure of enlarged sacral glands (Cruickshanks), of an enlarged ovarium descending in the pelvis (Moeller, Odier, &c.), and of various kinds of tumours — sarcomatous, steatomatous, fibrous, and cartilaginous — developed in the omentum, within the pelvis, &c. (Lauth, Reidlin, Schæffer, Osiander, Hufeland, &c.).

11. *C.* Obstinate constipation may also depend upon, or at least be connected *with, injury or disease of the spine.* In delicate females, it is not uncommon to find fæcal retentions proceeding from this cause. In many of such cases, much pain is felt when the spine is examined, indicating the presence of inflammatory irritation of the envelopes of the chord, or scrofulous disease of the bodies of the vertebræ. In cases of this description, the functions of the intestinal canal are impeded, or otherwise disordered, by the morbid influence exerted by the spinal nerves upon the organic nervous system, through the medium of their communications with this system.

12. II. The Consequences and Terminations of constipation require the utmost attention, as respects both the prevention of such of them as are unfavourable, and the recognition of their early approach. Among the most common *remote* consequences of fæcal retention, are cutaneous eruptions, headachs, vertigo, various

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* The following case is not only extraordinary but instructive: — M. G——, a medical officer in the French service, was always costive from birth. He ate largely, but seldom passed a stool oftener than once in one or two months; and his abdomen assumed a large size. At the age of 42, his constipation was usually prolonged to three or four months. In 1806, after medicines had been taken to procure a stool, which had not been passed for upwards of four months, abundant evacuations continued for nine days, and contained the stones of raisins taken a twelvemonth before: but the constipation returned. In 1809, the enlarged abdomen became painful, vomiting supervened, and he died at the age of 54, having seldom, through life, passed more than four, five, or six stools in the year. On opening the abdomen, a fibrous partition obstructed the rectum about an inch from the anus. Immediately above this partition, the rectum was so enormously dilated as to fill all the pelvis, and nearly all the abdomen. The enormous cloaca contained thirty *kilogrammes* of brownish black and very offensive pultaceous fæces. Its inner surface presented gangrenous and ulcerated patches. The lower part of the colon was enlarged to the size of the stomach; which, with the small intestines, liver, &c., appeared diminished in volume and capacity by the pressure of the distended rectum. (Renauldin, in *Dict. des Scien. Méd.* t. vi. p. 257.)

dyspeptic symptoms, chlorosis, hysteria, and chorea. The straining at stool is liable to produce apoplexy and hernia in aged, and hæmoptysis in young persons. When constipation is neglected or improperly treated, the most serious effects are produced *immediately* upon the bowels themselves; *hæmorrhoids*, severe *colic*, passing into *ileus* or *enteritis*, being not infrequent results. These very serious consequences of constipation may, however, proceed as much from the use of too powerful drastic or acrid remedies, to procure evacuations, as from the fæcal retention. I have repeatedly seen dangerous effects follow a large, or even a moderate dose of castor oil, which had become rancid or acrid by exposure to the air, or by long keeping. When the constipation has continued long, the most distended portions of the bowels, either by flatus or accumulated fæces, sometimes pass rapidly and insidiously into an inflamed state, which, if not speedily subdued, soon terminates in sphacelation, or in a kind of sphacelating ulceration. In all cases, therefore, of obstinate, and even of early constipation, the state of the abdomen — particularly in respect of tension, tumefaction, hardness, definite or indefinite tumour, tenderness, heat and dryness of skin, and pain on pressure, &c. — should be carefully examined by touch, and *mediate percussion*; and if any of these symptoms be present, the accession or early progress of inflammation, and other unfavourable consequences now noticed, should be dreaded or even inferred. If, to these be added nausea and vomiting, heat of skin, high-coloured urine; an erect, white, or loaded appearance of the papillæ of the tongue; hard, constricted, or oppressed pulse, even although it may be slower than natural; and more especially if pain, tension, &c. be present, with hiccup; inflammatory action of a serious or unfavourable kind is obviously present, or even far advanced, and calls for the most decided means. (See arts. Colic, and Intestines — *Inflammation of*.) Nor should we overlook the fact, that constipation is a very common symptom of enteritis, which may actually exist without occasioning much febrile disturbance, or affecting the pulse; great care is therefore necessary at the outset, in distinguishing simple constipation, from the constipation which proceeds from the slow and insidious occurrence of inflammation of the intestines, — a *diagnosis*, which only a careful examination of the abdomen, and enquiry as to the above symptoms, can furnish.

13. III. The Prognosis in constipation is *very favourable* in slight cases, and in those of short duration, particularly when unattended by nausea or vomiting, or by pain, tenderness, and tumefaction of the abdomen, or by any febrile symptoms: it should be given with great caution when these symptoms are present, as they indicate the accession of inflammatory action: and it ought to be *unfavourable*, when the obstruction is prolonged notwithstanding the judicious employment of remedies, or when any of the symptoms indicating the accession of the unfavourable terminations noticed above make their appearance; for these states of disease are more dangerous when they supervene on obstinate or prolonged constipation, than when they occur in a simple and idiopathic form. When fæcal retentions apparently proceed from any of the organic changes enumerated above (§ 9, 10.), the prognosis will necessarily depend upon the nature, seat, and extent of these lesions, as far as they can be ascertained; as, for example, when it is owing to enlargement of the prostate, contractions of the rectum and colon, tumours in the pelvis, &c., an opinion of the result, although generally unfavourable, will vary according to numerous concurrent circumstances, particularly as respects a permanent recovery, or an immediate or remote occurrence of a fatal issue.

14. IV. Treatment. — The means of cure in every case of constipation are directed with the intention, 1st, of procuring fæcal evacuations by as gentle and unirritating means as may be adequate to the purpose; and, 2dly, after having fully accomplished this end, of preventing a recurrence of a torpid condition of the bowels and digestive organs generally.

15. i. *The removal of existing constipation.* — *A.* The *slighter* and more *common cases of constipation* are most benefited by the use of such means as are generally employed to promote the secretions poured into the intestinal canal, and to excite its peristaltic action. About three or four grains of blue pill, either with or without a little Castile soap and extract of taraxacum, taken at bed-time, once or twice a week; and a draught consisting of equal quantities of the compound infusions of gentian and senna, with a little neutral salt, &c. (see F. 205. 266.); or of the compound decoction of aloes; on alternate mornings, will generally be all that is required. Besides these, any of the stomachic and aperient medicines prescribed in the Appendix may be adopted (see F. 215. 252. 558. 574.); the patient having recourse to the shower bath, or cold plunge bath, in the morning, and resorting regularly to the water closet after breakfast.

16. *a.* In the slight, as well as in *habitual* and frequently recurring constipation, it will be useful to ascertain, as accurately as possible, the particular viscera in fault, and what function is deficient (§ 6. *et seq.*). When we suspect that the duodenum and *small intestines* are especially affected (§ 6.), the compound infusion of senna, or the infusion of rhubarb, combined, according to the circumstances of the case, either with the alkalies or their sub-carbonates, or with vegetable bitters and tonics, or with ipecacuanha, taraxacum, and antispasmodics, as here directed, will generally remove all disorder. (See also F. 251. 391. 506. 562.)

No. 143. ℞ Infus. Rhei (vel Infus. Sennæ Comp.), Aquæ Pimentæ, āā ʒ vj.; Liq. Potassæ ♏ xx.; Extracti Taraxaci ʒ j.; Spirit. Myristicæ ʒ j. M. Fiat Haustus, mane vel horâ somni sumendus.

No. 144. ℞ Infus. Sennæ Comp. ℥ vss.; Sodæ Sub-carbon. ʒ jss.; Vini Ipecacuanhæ ʒ jss.; Spirit. Ammon. Arom. et Tinct. Hyoscyami āā ʒ j.; Tinct. Cardamom. Comp. ʒ ij. M. Fiat Mist., cujus capiat Coch. iij. larga mane nocteque.

No. 145. ℞ Infus. Calumbæ (vel Infus. Gentianæ Comp.), Infus. Sennæ Comp., āā ℥ ijss.; Liq. Potassæ ʒ jss., Extr. Taraxaci ℥ ss.; Spirit. Pimentæ (vel Myristicæ) ʒ ij. M. Fiat Mist., de qua sumantur Coch. iij. larga horâ somni, vel primo mane.

No. 146. ℞ Extr. Colocynth. Comp. ℈ ij.; Saponis Castil. gr. x.; Pulv. Ipecacuanhæ gr. vj.; Extr. Hyoscyami ʒ ss. Contunde bene simul et fiant Pilulæ xviij., quarum capiat binas horâ somni quotidiè.

No. 147. ℞ Decocti Aloës Comp. ℥ ivss.; Liquoris Potassæ (vel Sub-carb. Sodæ) ʒ j.; Vini Aloës ʒ vj.; Extr. Taraxaci ʒ iij.; Spirit. Pimentæ ℥ ss. M. Capiat tertiam vel quartam partem pro dose, et repetatur pro re nata.

No. 148. ℞ Magnes. Sulphatis ʒ j. (vel Potassæ Sulphatis ʒ ss.); Infus. Rosar. Comp., Infus. Gentianæ

Comp., āā ʒ vj.; Acidi Sulphurici Arom. ♏ x.; Tinct. Sennæ (vel Tinct. Aurantii) ʒ j.—ʒ ij. M. Fiat Haustus, omni meridiè capiendus.

In most instances of constipation depending upon torpor of the small intestines, and *deficient biliary secretion*, a full dose of blue pill or of calomel should be exhibited at bed-time, and a common black draught the following morning, at the commencement of the treatment, with the view of promoting the secreting functions of both the liver and the mucous follicles of the bowels; and a moderate action ought to be kept up for some time subsequently by the remedies now adduced.

17. *b.* In those cases in which the *large bowels* are chiefly in fault, the preparations of aloes variously combined, the means already mentioned, particularly ℞ 146, 147., or those recommended in the articles on the Colon, and on Colic, will be generally found appropriate. In some instances, however, it will be requisite to have recourse to more powerful cathartics than I have yet mentioned — particularly when irritability of the stomach, or of the system generally, does not exist — and to promote their action by enemata. The following, or F. 140, 141. in the *Appendix* may be employed.

No. 149. ℞ Pulv. Jalap. gr. xij.; Pulv. Scammoniæ gr. v.; Potassæ Sulphatis ʒ j.; Olei Caryoph., et Ol. Carui, āā ♏ iij. Tere bene simul, et fiat Pulvis in quovis vehiculo idoneo sumendus.

No. 150. ℞ Magnes. Sulphatis ʒ vj.; Infus. Sennæ Comp. ℥ ij.; Tinct. Jalap. ʒ j.; Tinct. Opii ♏ vj.—x. (vel Tinct. Hyoscyami ʒ ss.); Tinct. Castorei, Spirit. Pimentæ, āā ʒ j. M. Fiat Haustus.

No. 151. ℞ Extr. Colocynth. Comp. ℈ ij.; Saponis Castil. gr. xij.; Olei Crotonis gtt. iij. (vel Extr. Nucis Vomicæ gr. iij.) M. Fiant Pilulæ xii. Capiat duas horâ decubitus.

No. 152. ℞ Mannæ ℥ j.; Infus. Anthemidis ℥ xij.; solve, et adde Olei Olivæ ℥ ijss.; Magnesiæ Sulphatis ℥ jss. Sit Enema.

18. *c.* In cases apparently depending upon deficient tone of the muscular coat of the large bowels, and imperfect propelling power of the upper part of the rectum, I have seen benefit derived from combining the spirituous extract of nux vomica or strychnine with the pilula aloës cum myrrha, or with the compound extract of colocynth, as directed above in ℞ 151., in place of the croton oil. When this state is connected with deficient secretion from the intestinal mucous surface (§ 7. *b.*), small doses of the croton oil, from one sixth to one half of a drop, combined with some other purgative, and repeated daily, or on alternate days, will remove obstructions from, and restore the secretions of, the mucous follicles. In cases also where the internal surface of the intestines are loaded with a viscid mucous sordes (§ 7. *g.*), it acts more efficiently than any other medicine, particularly when combined as above (℞ 151.), or with calomel or blue pill, and restores more permanently the functions of the intestines. I have recently met with several cases of constipation consequent upon attacks of pestilential cholera, and in nearly all of these I have inferred the existence of not only imperfect peristaltic action of the bowels, but also an accumulation of viscid, mucous, or albuminous sordes on their internal surface, — an inference confirmed by the state of the evacuations. The combination of purgatives now alluded to has proved more efficacious in removing this morbid condition, than any other I have employed.

19. *d.* In *children* and *young females*, constipation is generally attended, even if it be not caused, by deficient secretion from the mucous follicles, and by an accumulation of mucous sordes (the *Saburra intestinales* of the older writers, and the *Embarras Sabural* and *Embarras intestinal* of French authors) on the internal surface of the bowels. In these cases, a dose of calomel, with either jalap or scammony, and triturated with sugar, and followed by castor oil, or the infusion of senna with salts, or by the decoction of aloes, &c., according to the circumstances of the cases, will generally procure full evacuations. But in many such cases, the repeated exhibition of these will be required before the collected sordes can be removed; and even when the evacuations have assumed a healthy appearance, it will be requisite to resort occasionally to purgatives combined with tonics and resolvents — such as senna, aloes, or rhubarb, with gentian, cascarilla, cinchona, or calumba; and with potass, soda, &c., before the functions of the bowels will be altogether restored.

20. *e.* When the fæcal retention assumes the form of *obstipation*, and is attended with difficult or imperfect evacuation; or with frequent desire, and tenesmus; and with hard, rounded, scybalous discharges; we may infer the existence of rigidity of the longitudinal bands of the colon (§ 7. *e.*); and should combine anodynes and antispasmodics with purgatives. I have commonly derived most advantage from small doses of castor or olive oil, exhibited frequently, in some carminative or aromatic water, with a little tincture of hyoscyamus and ipecacuanha wine; and from demulcent, anodyne, and oleaginous clysters (F. 143, 144. 795.) Electuaries, also, consisting of the confection of senna, with cream of tartar, magnesia, extract of hyoscyamus, &c. (see F. 96. 98.), will generally prove more serviceable, in these cases, than very active medicines. When the retained scybalous fæces produce irritation of the colon, the frequent calls to stool, and the scanty, mucous, and watery evacuations, may lead the practitioner to suppose, if he rely upon the account of the patient only, that diarrhœa, instead of constipation, actually exists, and hence to adopt an improper treatment. In these cases, the warm or tepid bath, the addition of ipecacuanha, or hyoscyamus, or both, to the purgatives given by the mouth, and the use of clysters with infusions of ipecacuanha and linseed, and with olive, linseed, or almond oil, will generally procure the evacuation of scybalous fæces. When the bowels are distended by flatus, the operation of aperients will be most assisted by gentle friction of the abdomen; and confidence to persist in the use of it will be given by directing the friction to be employed with some liniment (F. 298. 306.), or with ℞ 157. subjoined.

No. 153. ℞ Olei Ricini recentis ʒ j —ʒ ij.; tere cum Vitelli Ovi unius, et adde terendo, Vini Ipccacuanhæ ♏ x.; Tinct. Hyoscyami ♏ xv.; Tinct. Castorei ♏ xx.; Aquæ Pimentæ ʒ xj. M. Fiat Haustus, 4tâ vel 5tâ quâque horâ sumendus.

No. 154. ℞ Potassæ Supertart. in pulv. ℥ j.; Sodæ Sub-carbon. exsic. (vel Magnes. Calcinat.) ʒ iij.; Confectionis Sennæ ℥ jss.; Confectionis Rutæ ʒ ijss.; Extr. Hyoscyami gr. xij.; Pulv. Ipecacuanhæ gr. ij.—iij.; Tinct. Capsici ʒ ss.; Syrup. Zingiberis q. s. ut fiat Electuarium, cujus capiat partem quartam 4tis vel 5tis horis donec plenè dejecerit alvus.

No. 155. ℞ Sodæ Sulphatis, Mannæ Opt., āā ℥ j., solve leni cum calore in Aquæ Menth. Virid. ℥ vjss., et adde Tinct. Sennæ ℥ j.; Vini Ipecacuanhæ ʒ j.; Tinct. Capsici ʒ ss.; Spirit. Carui ʒ ij. M. Capiat Coch. larga quatuor tertiis vel quartis horis.

No. 156. ℞ Olei Amygdalæ, Olei Ricini, Mannæ Opt., āā ʒjss.; Aq. Pimentæ ʒxj. M. Fiat Haustus, 4tis, 5tis, vel 6tis horis sumendus.

No. 157. ℞ Unguenti Cetacei ℥jss.; Olei Carui et Tinct. Opii āā ʒjss. Misce, et fiat Linimentum, cum quo illinatur abdomen, urgente flatu.

21. *B. a. In the more obstinate or prolonged cases of constipation*, which have resisted the above, or any other means usually employed to procure evacuations, we should endeavour to ascertain, by enquiring into the previous state of the patient's digestive and intestinal functions, and by examining the abdomen, rectum, and parts in the vicinity, the probable cause of obstruction. The account which may be furnished of the appearance of the evacuations heretofore, and of the facility with which they had been evacuated, as well as of the sensations felt before or at the the time of evacuation, will very materially guide the judgment of the practitioner in concluding respecting the existence of organic disease of the colon or rectum, or in the vicinity of the latter. Frequent attacks of diarrhœa, tenesmus, or dysentery, previously to the occurrence of constipation, or of pain in the course of the colon, or along the sacrum, should always lead us to suspect narrowing, or thickening, or both, in some part of the colon or rectum (§ 9. *d*.). In such cases, we should endeavour to solicit fæcal discharges by oleaginous and saponaecous clysters, and frictions of the abdomen, rather than by purgatives taken by the mouth; and we ought not to be too officious in the use of these; but should so study the feelings of the patient, as to prevent irritation and febrile disturbance — the harbingers of inflammation — from coming on. In those cases particularly, examination of the state of the rectum, and the lower part of the colon, by the introduction of the long flexible bougie, as recommended by Dr. Willan, should not be omitted; and if any stricture exist within the reach of this instrument, its gradual dilatation should be attempted. If a stricture be reached, it may be of service to use a hollow bougie, along which enemata may be thrown up so as to pass beyond the seat of obstruction, which might otherwise not be overcome by them. Instances have been met with, in which stricture and organic disease of the colon have apparently existed for some time without constipation having been complained of; and yet the exhibition, when constipation did take place, of acrid purgatives in large and repeated doses, has been soon followed by an unfavourable issue, which, however, might not have been much longer deferred by any treatment whatever. Cases illustrative of this occurrence have been recorded by Home, Sterry, Annesley, &c. (See references.)

22. *b*. In almost every instance in which the bowels still remain obstinately costive after two or three doses of purgative medicine have been given, but without any urgent symptom being complained of, it will be more advantageous to use gentle means, to trust chiefly to enemata, and to wait patiently the result, than to prescribe medicines which will irritate, and invert the action of the upper part of the digestive tube without reaching the seat of obstruction. If, notwithstanding, symptoms of inflammatory action begin to appear; or if the stomach become irritable; or if the pulse be oppressed, hard, or constricted; or if the patient be plethoric and of a sanguine or irritable temperament, venæsection; or the application of leeches to the abdomen, or both, should be resorted to, and hot poultices and fomentations, or the warm turpentine epithem, or a blister, be afterwards placed upon the belly. The patient may then be left quiet for several hours, in expectation of the action of the purgatives previously given; or, if the stomach be irritable, soothing and anti-emetic remedies (F. 178, 179. 357.) only, or a full dose of calomel with opium or hyoscyamus, should be taken, and after a few hours the enema may be repeated. In cases of obstinate constipation, unconnected with contraction of the colon or rectum, a large dose of calomel, either alone, or with opium or hyoscyamus, may be exhibited, and repeated once or twice, at distant intervals; each dose being followed either by castor oil, or by the common black draught, or by half an ounce of turpentine with an equal quantity of castor oil in any suitable vehicle. But where inflammatory disease, or lesions consequent upon inflammation, are suspected to exist in either the colon or rectum, calomel, or even a full dose of blue pill, will often aggravate the mischief, unless emollient enemata be frequently thrown up. Indeed, I believe, from the experiments and observations I have made respecting the action of calomel on the alimentary canal — from remarking its effects in irritating and inflaming the inner surface of the colon and rectum when taken in large doses — and from the history of the previous ailments, and treatment of many of those who have had stricture of the rectum or colon — that a very large proportion of such cases has been brought on by the frequent use of calomel as a purgative.

23. *c*. When we believe that constipation is owing to a torpid or paralysed state of the muscular coats of the large bowels, and the accumulation of hardened fæces consequent thereon (§ 9. *a*.), oleaginous purgatives given by the mouth; in some cases, a full dose of calomel, followed by a turpentine and castor oil draught; and, subsequently, oleaginous, saponaceous, and terebinthinate enemata; are generally the most appropriate means. If, however, these fail, then small but repeated doses of castor, olive, or almond oil; frequent demulcent enemata; the aspersion of cold water over the abdomen or lower extremities; or injections of cold water, may be tried. (See § 26.). If there be great inflation or fæcal distension of the colon, friction, with the carminative liniment prescribed above (℞ 157.), may also be employed, with various other internal and external means recommended in the articles on Colic and Colon. In aged females especially, hardened fæces sometimes collect to such an extent, and are lodged so firmly in the rectum and lower part of the colon, as to require removal by mechanical means. Cases of this kind have been detailed by Schurig, Petit, Bishoprick, Secheverel, White, &c., and have occurred in my own practice, as well as in that of many others. They require the careful introduction of a marrow-spoon, or some similar instrument, into the rectum, to break down the fæces; and subsequently the means just stated, particularly oleaginous and terebinthinate injections thrown up by the pump apparatus now in general use, which should be provided with a large and very long pipe, or with a long, hollow, and flexible

bougie, which ought to be passed as far as possible up the rectum.

24. *d.* If alvine obstruction be apparently owing to organic, malignant, or other diseases about the uterus, its appendages, the vagina, or rectum (§ 10.); or to spasmodic constriction of the sphincter ani excited by inflammatory irritation in its vicinity, or by hæmorrhoids, the warm bath, semicupium, or the hip-bath; the vapour of hot water and narcotic decoctions directed to the anus; anodyne and relaxing injections; and the extract of conium or hyoscyamus, made into either a suppository or an ointment, with the addition of a little of the extract of belladonna; may be prescribed, along with such other measures as the circumstances of the case may require.

25. *e.* When constipation is dependent upon, or associated with, disease of the spine, or inflammatory irritation of the membranes and envelopes of the chord, leeches should be applied near the place where pain is complained of; or the patient may be cupped in the vicinity, kept quiet, and in the horizontal position; and the action of the bowels promoted by the means stated above (§ 16, 17.), and by terebinthinate injections. If inflation of the bowels exist, the carminative liniment may be employed; and if tenderness, tension, or pain of the abdomen be complained of, leeches, followed by fomentations, &c. as already advised (§ 22.), should be resorted to.

26. *C.* Besides the above, other means have been recommended by authors in various states of the disease, and found of much service when appropriately prescribed. Joerdens advises the frequent administration of *assafœtida* in enemata, and, in cases of deficient secretion and healthy action of the colon, it is certainly of essential use, either alone or in conjunction with purgative medicines. Starke recommends the inspissated *ox-gall*, both in the form of pills and in clysters. In the latter form, it is calculated to prove an excellent adjuvant of other means; and when combined with aloes, taraxacum, soap, extract of gentian, &c. (F. 559. 562.), it is very serviceable in restoring the healthy functions of the bowels, and digestive organs generally. Wendt directs repeated clysters of the decoction of *gratiola* to be thrown up. Numerous writers have advocated the application of *cold*, in cases of obstinate constipation. Schenk, A Fonseca, Blankard, and Laison advise the patient to walk or stand upon a marble pavement or slab; and Brassavolus states that Savanarola cured the Duke of Ferrara, by making him walk barefooted over a cold wet marble floor. Stevenson, Falconer, Percival, and Spence direct the affusion of cold water over the lower and upper extremities, and adduce cases wherein the practice had been successful after other measures had failed. Kite, Bartram, Sancassini, and Schmidtmann recommend cold epithems, and the affusion or aspersion of cold water, over the abdomen; and Kaehler, Korb, and Brandis advocate the administration of cold clysmata, in addition to the employment of cold externally. The cold and tepid *shower bath*, the cold plunge bath, and warm and tepid bathing, have severally been resorted to in aid of other measures, and are frequently of use, — the former particularly in habitual constipation, the latter in cases attended by difficult and imperfect evacuation, and seemingly dependent upon rigidity of the longitudinal bands of the colon. *Electricity* and *galvanism* have been employed successfully by Kite, Sigaud la Fond, Grapengiesser, and Clarkson; and the injection of *tobacco smoke,* and of a weak infusion of the leaves of *tobacco,* has been advised by Von Mertens, Vogel, and other authors referred to, when discussing the *treatment* of Colic and Ileus (*which see*). The decoction of *berbery;* powdered *charcoal* (Mitchell and Daniel), in the dose of one, two, or three table-spoonsful given every hour in milk or lime water; frictions of the abdomen (Quelmalz); inunction of it with *linseed* or *olive oil* (Riedlin, &c.); fomentations consisting of senna leaves made hot and moist by boiling water, and placed over the abdomen (Petit); purgative extracts; tinctures, and infusions, applied to this situation, either in the form of ointment or fomentation (Schenck, Alibert, &c.); and enemata containing *tartarised antimony* (Elias), have also been employed. The exhibition of *emetics* was advised by Hippocrates, Praxagorus, Cælius Aurelianus, and Alexander Tralles; and of ipecacuanha or antimonial emetics by Stoll, Sims, Sumeire, Deplace, and Hosack. I have seen benefit derived from inunction of the abdomen with an admixture of castor and linseed oils, to which three or four drops of croton oil had been added. In a great proportion of the cases of constipation which have occurred to me since 1817, when I first adopted the practice, very certain and immediate advantage has been derived from a full dose of calomel (either with or without opium or hyoscyamus), followed in a few hours by half an ounce of oil of turpentine, and an equal or somewhat larger quantity of castor oil, taken either in a cup of milk, or in a glass of some aromatic water. The action of these has usually been promoted by an injection containing castor, olive, or almond oil; and, if the operation has not been sufficiently copious, another dose of castor oil has been given, and the enema repeated.*

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* The following *synopsis* exhibits a succinct view of the *treatment*:— 1. If the pulse be hard or constricted, and if there be pain, increased on pressure, bleed generally or locally, or both — apply blisters or hot fomentations, or the cold affusion, or cold epithems, &c., on the abdomen; afterwards exhibit purgatives, enemata, &c. 2. If constipation seems to arise from diminished secretion and exhalation, give calomel or blue pill, carbonates of the alkalies, jalap, the purgative oils, senna, camboge, elaterium, croton oil, &c., according to circumstances. 3. If it depend upon a rigid fibre and habit of body, combine purgatives with relaxants and nauseants — with ipecacuanha, antimony, colchicum, soda, hyoscyamus, &c.; prescribe emollient and relaxant medicines in preference to those that are acrid; and give them with antispasmodics and sedatives. 4. When it arises from torpid peristaltic action and lessened secretion, conjoin tonics, gum resins, and bitters, with purgatives and aperients; myrrh, assafœtida, galbanum, &c., with aloes; sulphate of quinine, or ext. of gentian with aloes; the alkaline solutions, with tonic infusions; use friction with stimulating liniments to the abdomen, or along the spine; resort to the cold salt-water bath or shower bath, and the tonic and aperient mineral waters of Cheltenham, Leamington, Vichy, and Carlsbad. 5. When it is attended by accumulations of hardened fæces in the colon, have recourse to copious soapy or oily clysters — to the introduction of a marrow-spoon to break down the fæces — to the injections of cold water, &c. by the valve-apparatus, with a long bougie attached to the pipe — to the aspersion of cold water on the abdomen, or the application of cold to the lower extremities, &c. 6. If it proceed from organic change of the large bowels, or of parts affecting them, solicit evacuation by emollient and relaxant enemata, and

27. ii. The *prevention of a recurrence of the disease* should be strictly guarded against, particularly after active cathartics have been given to remove it. Purgatives, aperients, or laxatives, combined with stomachic bitters and tonics (F. 187. 266. 872.), ought to be taken daily, and afterwards on alternate days, until the functions of the bowels are fully restored. The patient's diet should be light and nutritious; all astringent and indigestible substances avoided; and, if the abdominal secretions be deficient, an occasional dose of blue pill, or hydrarg. cum creta, and a course of taraxacum, with deobstruent laxatives and tonics (F. 390. 510. 873.), prescribed. Subsequently a course of Leamington or Cheltenham mineral waters, or the artificial Seidschutz, Marienbad, and Carlsbad waters, and in some cases the Pyrmont and Spa waters, will prove of much benefit. The shower bath, upon getting out of bed, or the cold salt-water bath, will further tend to promote the digestive and defæcating processes. Costive persons, with a large or pendulous abdomen, should wear a broad belt or bandage around it, which will serve to promote the functions of the bowels. The patient should carefully avoid the remote causes of constipation, attend daily to the first intimations to stool, and have an early recourse to medicine when such intimations are delayed beyond the usual time. When the bowels require the assistance of medicine to preserve them in a regular state, aloes may be combined with mastich and Cayenne pepper, or with a bitter extract, myrrh, and assafœtida, and taken daily about two hours before dinner.

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CONSUMPTION. See PULMONARY CONSUMPTION, and MESENTERIC CONSUMPTION.

CONTAGION. See INFECTION.

CONVULSIONS.—SYN. Σπασμός, Gr. *Spasmi Clonici, Motus Convulsivi, Distensiones Nervorum, Conductiones*, Auct. Var. *Convulsion*, *Spasme*, Fr. *Zuckungen*, Ger. *Convulsioni*, Ital. *Convulsion Fits.*

CLASSIF. 4. *Class*, Nervous Diseases; 3. *Order*, Spasmodic Affections (*Cullen*). 4. *Class*, Affecting the Nervous Function; 4. *Order*, Affecting the Sensorial Powers (*Good*). II. CLASS, III. ORDER (*Author*, in *Preface*).

1. DEFIN. *Violent and involuntary contractions of a part, or of the whole of the body, sometimes with rigidity and tension* (tonic convulsions) ; *but more frequently with tumultuous agitations, consisting of alternating shocks* (clonic convulsions) ; *that come on suddenly either in recurring or in distant paroxysms, and after irregular and uncertain intervals.*

2. Convulsions have attracted a due share of attention from the medical writers of all ages. HIPPOCRATES states, that "convulsions arise either from repletion or evacuation" (*Aphor.* sect. vi. § 39.) ; and GALEN, whilst he admitted the propriety of referring them to these two morbid states, argued for a *third*, namely, irritation occasioned by a morbid humour. ÆTIUS adhered to a similar arrangement, but considered that the *third* of these pathological conditions performed the principal part. Subsequent writers, chiefly copiers or commentators on GALEN, adopted his views. ZACUTUS LUSITANUS imputed much importance to the second morbid state of GALEN, viz. *excessive evacuation*; and considered that a positive or relative dryness of the nervous and muscular system was occasioned by it. The writings of WILLIS and SYLVIUS DELEBOË made some alterations in the received doctrine of the origin of convulsions, by referring more than their predecessors had done to the nervous system and animal spirits, and less to

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suppositories; sooth local and constitutional irritation, preserve the functions of the stomach, and give the alkaline solutions with conium, belladonna, &c.—(*From the Author's short Notes of his Lectures delivered from* 1824 *to* 1829.)

the influence of morbid humours. It was not, however, until the appearance of the writings of F. Hoffmann, that a spirit of accurate investigation was manifested in this department of medical enquiry. This writer, to whom our science still continues under great obligations, regarded convulsions as a consequence chiefly of a morbid state of the spinal chord and its membranes, — an opinion which has been adopted by many, and which numerous facts seem to support, in respect of several manifestations of these complaints, although it cannot so frequently be shown that this part of the voluntary nervous system is that primarily affected.

3. The opinions respecting the nature and relations of convulsions, entertained during the last century, and what has past of the present, have been so numerous and vague, that the advantages resulting from a review of them could by no means compensate for the limits they would occupy. Such of them as deserve notice will be referred to hereafter. It may, however, be remarked respecting them, generally, that no two writers of reputation agree as to either the import of the word, the diseases coming within this denomination, or the manner of arranging and considering them. Under such circumstances, the systematic and eclectic writer might be placed in much difficulty, if he had not extensive and diversified experience to guide him. Upon this, however, my chief reliance is placed, even while I endeavour to profit by the labours of my predecessors,— some of them my followers in the adoption of important curative means in these affections.

4. If, in defining convulsion, we state it to be "*an anormal action of muscular or fibrous parts,*" we at once make it synonymous with spasm, and embrace a most numerous class of diseases, viz. those forming Dr. Cullen's order, Spasmodic Diseases, as well as many of those in which spasm is merely a part of the morbid state. If we define it to be "*an irregular or anormal action of voluntary muscles,*" we shall comprise all those maladies, which usually put on nearly a regular form or type, owing to certain peculiarities of the spasmodic action and concomitant phenomena; as tetanus, epilepsy, &c. But if we adopt the more confined and precise definition given above, those disorders only which assume no regular type; but which, whilst they approach, on the one hand, those of a regular form, often pursue, on the other, very eccentric courses, and even anomalous states. It is impossible to consider the diseases of the frame in a way true to nature, and at the same time as abstract entities — as species perfect and distinct of themselves. They are individually, in truth, merely certain morbid states, lapsing on the one side insensibly into others, to which, although most intimately allied in every respect, different names have been but too arbitrarily assigned; and passing on the other side into affections otherwise denominated, although not materially differing in their natures. Thus, if we make spasm the essential character of one great family of diseases, we may divide it into subordinate orders, genera, and species, according to the parts affected, and the functions concomitantly disordered, and the permanency, the rigidity, the relaxations, and the frequency of recurrence of the spastic action. But still the essence of disorder will be very generally the same; and each of these subdivisions—each of the manifestations of the particular morbid states made the basis of distinction — will so insensibly glide into each other, as to defy the possibility of drawing lines of demarcation between them. The practitioner will be unable, on many occasions, to detect in practice the specific differences assumed; and will continually meet, as I have in many hundreds of instances, with cases which he cannot refer to one species more than to another, and which are as much eclampsia as epilepsy, or as much what are usually called convulsions as either the one or the other. If we take the character of the spasm, in respect of permanency, rigidity, relaxation, and recurrence, as a basis of arrangement of all the diseases attended by anormal action of voluntary muscles, we shall have every grade, passing imperceptibly from the most acute form of tetanus through cramp, epilepsy, eclampsia, convulsions, &c., down to the most atonic states of chorea and tremor. Also, if we consider the affections called convulsions, and which are usually irregular in their forms, with reference to the character of the anormal contraction of the muscles, we shall perceive it in some cases of the most violent and spastic nature, frequently of some continuance, the relaxations being of brief duration, or scarcely observable; and in others nearly or altogether approaching to tetanic. These constitute the more *tonic* form of convulsions, from which there is every possible grade, down to the *atonic* or most *clonic* observed in chorea or tremor. Thus, then, anormal actions of muscular parts, like all other morbid actions, may, in respect of grade, be either above or below the healthy standard — *tonic* and *clonic* marking each respectively; but between which there exists every possible degree; these terms being therefore entirely relative, and conveying no definite and unchanging meaning. But, besides varying remarkably as to grade, the anormal actions of voluntary muscles may be attended by numerous phenomena giving them specific characters. Thus, when accompanied with complete insensibility, or any other superadded morbid condition, they have been denominated epileptic, hysterical, &c.; and, from this circumstance, they assume certain types, but of no very constant or immutable kind. When, however, they are not so associated, they constitute a simpler state of disease, and put on less regular forms, affecting either the whole of the voluntary muscles, or a greater or less number of them.

5. I. Forms. — From this, therefore, it is to be inferred that, although Dr. Cullen, and many others, have considered convulsions as characterised by the clonic nature of the spasms — by the alternation of contraction and relaxation without the control of the will — yet this does not universally obtain, they sometimes assuming states approaching to tetanic, and every degree of violence, as well as length of duration. The more regular and specific forms of convulsion, as epilepsy, hysteric fits, raphania, hiccup, tetanus, rabidity, &c., are discussed in separate articles; I shall, therefore, consider at this place only those simple and irregular states of convulsion which do not fall within its more specific manifestations.

6. Simple convulsions present great diversity of character. They have been already shown to differ widely in violence and degree; and they vary as greatly in duration, modes of accession, and recurrence, as well as in the number of parts affected by them. Hence they may be *acute* or *chronic* — most frequently the former; *partial* or *general; continued, recurrent,* or *intermittent; uncertain* in their accession, or *periodic;* and they may, moreover, attack a number of parts in succession. The circumstances and causes which originate them will also impart to them certain characters, which, although frequently difficult of detection, should not be overlooked. Thus, they are either *idiopathic* or *symptomatic*, most frequently the latter, even when the primary lesion illudes observation. But these diversities of form, although most deserving of attention, can only partially serve as a basis for the practical consideration of convulsions. I shall therefore view them — 1st, in respect of their partial or local occurrence; 2d, as to their general manifestations; 3d, as they affect infants and children; and, 4th, as we observe them in connection with the puerperal states: I shall also notice them as associated with, or consequent upon, other acute diseases.

7. i. Partial or Local Convulsions. — Many of the disorders which have been imputed a convulsion of individual parts, fall more appropriately under the denomination of spasm. I shall therefore briefly notice only such as, from the alternation of relaxation and contraction, appear to approximate to the convulsive state. *A. Involuntary contractile parts* are more subject to spasmodic action, than to that which may be said to be really convulsive. Whether or not certain of the phenomena presented in various diseases of the alimentary canal, as gastrodynia, pyrosis, rumination, retchings, colic, borborygmi, ileus, the tormina of dysentery, &c., are more properly convulsive or spasmodic, must be entirely a matter of opinion, to which but little practical importance should be attached, as they are both modifications merely of the same proximate condition. This remark applies equally to the anormal actions sometimes presented by the urinary bladder and uterus; and it is probable that palpitations of the heart, and angina pectoris, are chiefly manifestations of convulsive contractions of this viscus. (See Angina Pectoris, and Heart — *Palpitations of*.) That hiccup is altogether owing to convulsive actions of the diaphragm, cannot be doubted. (See Hiccup.)

8. *B. Voluntary muscles and parts* present the most unequivocal appearance of partial or local convulsion; although several local affections, denominated convulsive by some writers, are, more strictly speaking, spasm or cramp of particular muscles. *a*. The muscles of the *eye-lids*, owing either to the contraction of an ill habit, or to irritation of the ophthalmic branch of the fifth pair of nerves, are sometimes clonically convulsed — forming the *nictitatio* of authors. *b*. The muscles of the *eye-balls* are also not infrequently similarly effected, particularly in infants and children — occasioning, particularly during sleep, rolling of the eyes. This state of local convulsion is common during dentition, and disorders of the stomach and bowels. Either a more severe state of convulsion of these muscles, approaching to spasmodic contraction of one or more of them, or a paralysis of their antagonists, will occasion distortion of the eyes, or strabismus, with or without irregular oscillations of the iris, dilated pupil, &c.; as in inflammatory and organic affections within the cranium, and in verminous disorders. *c*. Twitching convulsions of the *muscles of the face*, or those inserted into the lips; retraction of the angles of the mouth, giving rise to what has been called the *risus sardonicus;* are often observed, but generally as a symptom of the invasion or actual existence of most dangerous diseases; as inflammation of the encephalon, or of the diaphragm, and various organic changes affecting the substance of the brain. Twitchings of the muscles of the face, however, sometimes occur in persons of a nervous and irritable temperament, or with an excited brain, without any apparent disease. *d*. Convulsive movements of the *tongue* are seldom observed unconnected with irregular movements of other parts, unless in the diseases now named, and in apoplexy. *e*. Slight convulsive actions of the *muscles* of *the lower jaw*, giving rise to grinding of the teeth in sleep, are very common occurrences in persons with worms, or other diseases of the alimentary canal; or excited circulation of the encephalon. *f. Trismus*, or spasmodic contraction of these muscles, in infants, arises from disorders of the prima via, the impression of cold, or irritation of the umbilicus, but does not strictly fall under the head of convulsions. *g*. A clonically convulsed state of the *muscles* of the *neck* are sometimes, but rarely, observed, producing convulsive tremor, or shaking palsy of the head, which is aggravated on certain occasions of mental perturbation, and nervous or vascular excitement. (See Palsy, Shaking, and Tremor.) *h*. The abnormal actions which approximate more closely to the permanent or spastic contractions, and affect one or more of the cervical and adjoining muscles, are much more common, and are often induced by a current of cold air, by over-straining, or by inflammatory irritation about the bodies, or intervertebral substance of the upper cervical vertebræ; or from disease about the medulla oblongata or base of the brain; or from irritation of remote parts — as of the genital organs of the uterus or ovaria; or from strangulated hernia, — an instance of which last has been observed by myself. In all such cases, the head is drawn more or less to one side, or backwards, or forwards; but similar flexures of the neck often are occasioned by the paralysis of muscles on the side from which the head is bent, the tonic or natural action of the unaffected muscles drawing the head from the paralysed side. In the one case, however, the muscles are rigid and strung like a cord on the contracted side, and more or less pain is complained of either in them or in the vicinity, particularly on attempts to bend or turn the head or neck in an opposite direction; whilst, in the other case, these symptoms are wanting. These are more properly cases of spasm than of local convulsion, as the contraction seldom alternates with relaxation, but is commonly more or less permanent. However, cases sometimes occur, which are intermediate between permanent spasm and convulsion, especially as a symptom of the diseases last referred to. *i*. Convulsive movements in the

pharynx and *œsophagus*, impeding or preventing deglutition, are frequent in hysteria, and in the last stage of several fatal diseases. *k.* They also affect the muscles of the *larynx*, the *diaphragm*, and other respiratory muscles, either separately, in rapid succession, or nearly simultaneously. Some of these affections are transient, and the result of slight causes; as in sneezing, coughing, sighing, sobbing, &c.: others are extremely dangerous, owing to the nature of the parts affected, the severity and continuance of the convulsive movements, and the circumstances in which they supervene; as in spasm of the glottis, spasmodic croup, certain states of asthma, with severe fits of coughing, singultus, &c. *l.* Convulsive actions also occur in the *muscles of the abdomen;* as in hysteria, common and lead colic, and in consequence of intestinal worms. The most remarkable instances of true convulsion of the abdominal muscles merely, that I have observed, have occurred in adult persons infested by the large round worm. *m.* The *muscles of the spine* sometimes experience convulsive actions, but more frequently spastic contractions, occasioned by hysteria, disease of the bodies of the vertebræ or membranes of the spinal chord, injuries of adjoining parts, strangulated hernia, acute rheumatism, the passage of biliary or renal calculi along the ducts, and inflammatory irritation of the uterus or ovaria. *n.* Either one or both of the *upper extremities* are occasionally affected by convulsions, more commonly both. The fingers are generally clenched around the thumb, which is drawn upon the palm; the arm being either extended forcibly, and the hand turned as in pronation, or the fore-arm bent upon the arm, or both these occurring in rapid alternation. Such are the more tonic convulsions of the upper extremities; but their muscles also experience slight and extremely clonic contractions; as the *subsultus tendinum* often observed towards the close of fevers and diseases of the brain; the more tonic or spastic convulsions, particularly when affecting one arm only, also arising from lesions of some part of the encephalon, or of the upper portion of the spinal chord. *o.* Convulsions of the *lower extremities* are characterised by analogous movements, and chiefly affect the flexor and extensor muscles. The toes are bent downwards, and the legs and thighs either drawn upwards or extended, or both the one and the other alternately.

9. Convulsions of voluntary muscles may occur as now described, or in two or more situations, or even in different or opposite parts, either simultaneously or in succession. They may affect one side of the body only, the other being in its natural state, or paralysed. They much less frequently attack either half transversely.

10. ii. General Convulsions. — General convulsions observe no certain *mode* of accession. On some occasions they attack suddenly; but they are much more frequently preceded by premonitory signs, especially in children and chronic cases, — a knowledge of, and attention to, which may be made available in preventing their occurrence. They are also sometimes recurrent, or succeed each other, with more or less rapidity.

11. *A. The premonitory signs* are vertigo and dizziness, irritability of temper; flushings, or alternate flushing and paleness of the face; luminous or other spectra floating before the eyes; various noises in the ears; partial loss of sight or hearing; restless or unsound sleep, or uncommon weight or drowsiness; fulness or prominence, and rolling of the eyes; clenching, or grinding of the teeth, clenching of the hands, &c. during sleep; a tumid appearance of the countenance and hands; coldness or cramps of the extremities; slight tremors, shivering, horripilation, shudderings or horrors; nausea, retching or vomiting; or pain and distension of stomach and left hypochondrium; unusual flatulence of the stomach and bowels, or other dyspeptic symptoms; pains in the loins or back; frequent sighing or sobbing; numbness of various parts; stammering or impeded utterance, loss of memory, and absence of mind; palpitations, or slowness and irregularity of pulse; slow, laborious, or irregular respiration; and, sometimes, a copious discharge of limpid urine. In some instances, leipothymia, or threatened syncope, precedes the general convulsions.

12. *B. a. The more tonic seizure.* — The convulsive movements constituting the paroxysm generally follow rapidly upon one or more of the above signs, and vary remarkably as to violence and duration. During their continuance, the countenance is very much distorted; the eye-balls are prominent, full, wild, staring, and rolled in all directions; the eyelids are either open, or rapidly shut and opened; the patient grinds and gnashes his teeth, and sometimes foams at the mouth, or protrudes the tongue. The alternate contractions and relaxations of the whole voluntary muscles, and contractions and extensions of all the limbs, are performed with the utmost irregularity, rapidity, and with so great force, as often to require the united strength of several persons to preserve the patient from injuring himself. In these struggles, the teeth, or even the bones of the extremities, have been, in some instances, broken. The respiration is laborious, interrupted, and sometimes accompanied by a hissing noise. The countenance, and indeed the whole scalp, are sometimes tumid, bloated, or red, and often leaden or livid towards the close of the fit, particularly in plethoric persons, when the respiratory actions are much impeded, and the affection originates in cerebral disease. In other cases, the face is pale, and the pulse weak, or small and constricted. The urine and fæces are occasionally voided with violence during the paroxysm: occasionally large quantities of limpid urine are passed. In these, the pulse is generally full, strong, and commonly slow or irregular. In many instances, the general sensibility and consciousness are but very slightly impaired, particularly in the more simple cases, and when the proximate cause is not seated in the encephalon; but in proportion as this part is affected, primarily or consecutively, and the neck and face tumid and livid, the cerebral functions are obscured, and the convulsions attended by stupor, delirium, &c., or rapidly pass into, or are followed by, these states.

13. *b. The more clonic convulsions.* — Such are the common manifestations of convulsions, when they are not occasioned by inanition; the paroxysms, however, varying greatly in violence, duration, and frequency of recurrence, according to the degree of vital energy, and numerous other

circumstances. But when they arise from, or are associated with, exhaustion, excessive discharges, and evacuations of the vascular system, they assume a somewhat modified character. They are then not attended by sopor; the general sensibility and cerebral functions being but little, or not at all, affected. The pulse is frequent, small, weak, broad, or open; the features are but slightly distorted; the countenance is pale and collapsed; and the limbs and extremities cold, and much less rigidly convulsed than in the tonic or more spastic seizures. In many cases, the convulsive movements resemble a succession of general shocks, succussions, or shudderings, sometimes of great violence, and often of considerable continuance, occasioning the bed or room to shake, and terminating the life of the patient: in others, they consist of constant tossings of the limbs and trunk.

14. *C. Duration and recurrence.*—The paroxysm may cease in a few moments or minutes, or continue for some, or even many, hours. It generally subsides rapidly, the patient experiencing, at its termination, fatigue, headach, or stupor; but he is usually restored in a short time to the same state as before the seizure, which is liable to recur in a person once affected, but at uncertain intervals. After repeated attacks, the fits sometimes become *periodic* (the *convulsio recurrens* of authors). In adult females, they commonly accompany the menstrual periods. When they arise from organic disease within the cranium, each successive interval is generally shortened, ~~until~~ their recurrence is so frequent that the patient is scarcely recovered from the languor, or other symptoms, consequent on one seizure, until he has another, which at last either ends in profound coma, or terminates life.

15. *D. The modifications* of convulsions are extremely numerous. In some cases, the respiratory muscles are much affected, and the fit is accompanied with yelling and shrieks, evidently not proceeding from pain (the *convulsio ejulans*, or shrieking convulsion). In other instances, the abnormal movements shift from one part to another, or attack various muscles in succession. In these, the seizure is comparatively slight, and the cerebral functions not remarkably disturbed; the *convulsio erratica* of Dr. Good. In rarer cases, the seizure assumes the form of *convulsive tremor*, as remarked by Dr. Prichard; is attended with a hot perspiring state of the head, vertigo, and slight stupor; and continues one, two, or three hours.

16. *a.* Besides these, various other forms of convulsion occur, particularly in persons under the influence of a morbidly excited imagination, or religious enthusiasm; and in females endowed with the nervous and irritable temperaments, with great mobility of the muscular system, and who are affected by nervous or vascular excitement of the generative organs. On many occasions, these seizures have been propagated to a number of persons by sympathy. The convulsions which became almost epidemic in the west of Scotland, in 1742, and were occasioned by religious enthusiasm, are not only instances of a peculiar form of this affection, but also among the most striking on record of the influence of imagination, and of sympathy, or of imitation, in disordering the functions of the body. A number of persons were attacked nearly at the same time, when hearing the addresses directed to the imaginations and passions of their hearers by the followers of Whitfield; and always when impressed by the denunciations of vengeance, and hopes of salvation, which they set forth. The mental agony which was thereby induced, gave rise, in many, to the most violent tremblings and agitations of the body, which were frequently preceded by faintings, and followed by convulsions, and subsequently by sobbing, weeping, and crying aloud. In some cases, the convulsions produced epistaxis, which generally terminated the seizure. Such appears to have been the usual course of the paroxysm, according to the meagre accounts which have been furnished of it. (See *Edin. Med. and Surg. Journ.* vol. iii. p. 442.) The convulsions described by Mr. Cornish as having been prevalent in Cornwall in 1813 and 1814, owing to the same causes, hardly differed in any respect from the above.

17. *b.* The convulsions which were prevalent in some of the Zetland Isles during the middle and towards the close of the last century, but which have seldom occurred there since that period, seem to have had some resemblance to the foregoing, as well as to hysteria. Dr. Whytt has referred to the frequency of convulsions in these islands; and has adduced the extreme facility with which they were propagated among young women, as a proof of the existence of a wonderful sympathy between the nervous systems of different individuals. The convulsions now alluded to, commonly attacked adult females when at church; but men and young girls were not altogether exempted from them. They are described very nearly as follows, by gentlemen who had frequently witnessed them:—Persons affected, generally fall down in apparent fainting or swooning fits, and soon afterwards utter wild cries and shrieks, the sound of which puts all who are subject to the disorder in the same situation. Their limbs and bodies are tossed about, the most frightful screams being uttered by them all the while. Their heads are also thrown from one side to the other, and their eyes are fixed and staring. In this manner they roar and struggle for five or ten minutes, and then rise up without recollecting a single circumstance that happened to them, or being in the least fatigued by the exertions made in the fit. Females are most commonly attacked in a crowded church, and on occasions of public diversion and merriment.

18. Similar instances of the spread of convulsions, by the infection of sympathy or imitation have been recorded by writers, and cases of it have occurred within the observation of the author. Dr. Haygarth has adduced a remarkable occurrence of this description.—Twenty-three females, from 10 to 25 years of age, and one lad of 17, who had all intercourse with each other, were seized, in 1796, in Anglesea, with slight pain of the head, or of the stomach and left side, followed by twitchings or convulsions of the upper extremities, continuing with little intermission, and with much violence, for a considerable time. The disorder was not so violent in bed; but it continued in some cases during sleep. The pulse was moderate, the bowels costive, and the general health not much impaired. There was usually hiccup; and, when the con-

vulsions were most violent, giddiness, with loss of hearing and recollection. During convalescence, the least fright, or sudden alarm, brought on a slight paroxysm. (See CHOREA AND RELATED AFFECTIONS, &c.)

19. iii. INFANTILE CONVULSIONS.— Convulsions often attack infants of a delicate and irritable frame, and those who are seized by severe internal or constitutional disease, or are suffering some concealed visceral irritation. They occur most frequently in children under four or five years of age, and particularly during dentition. They decline in frequency from this epoch to the commencement of the second dentition, or about the seventh year, when they again are often met with. Mr. NORTH doubts that any increase takes place at the seventh year. The above is the result of my experience, which in great measure agrees with that of BEAUMES, TISSOT, and others. As infantile convulsions present various peculiarities in their causes, phenomena, complications, and consequences, and are besides among the most important morbid conditions which come before the practitioner, I shall consider them apart.

20. *A. Premonitory signs* often usher in the attack, but occasionally no such symptoms are observed. I suspect, however, that they are more commonly altogether overlooked, than entirely absent. They consist chiefly of manifestations of generally increased irritability. This is shown by the temper, if the child be a few months old or upwards; by want of sleep at night, and heaviness in the day, or by perfect insomnia; by a lighter and shorter sleep than usual, the child starting up on the slightest noises, or as from a frightful dream, with fits of screaming without evident or sufficient cause; by alternately flushed and pale countenance, or unwonted animation of the face and eyes, followed by languor and heaviness; by a half-closed or open state of the eyelids during slumber, with startings and twitchings; by fixed, vacant, staring eyes, the pupils being either contracted or dilated, or frequent oscillations of the iris, without being influenced by the admission of light, or contraction of one pupil while the other is dilated; by stretchings or rigid extensions of the limbs; by hiccup, or irregularity of breathing, or short gasps, followed by long laborious inspirations; by twitchings of the fingers, or clenching of the hands, or pressure of the thumb upon the palm, the fingers being extended and separated from each other, or frequently moved about; by the sudden relinquishing of the breast soon after having sought it eagerly, and the throwing back the head, with an expression of anxiety, and an appearance of difficult deglutition; and by fulness of the upper lip, with a pinched nose and countenance, and slight blueness below the eyes and about the mouth. Many of these symptoms, designated by the vulgar, "*inward fits*," may with justice be attributed to inflammatory irritation of the arachnoid, as indeed contended for by PARENT, MARTINET, LALLEMAND, &c.; and, in my opinion, especially of the arachnoid of the base and internal surfaces of the brain. BRACHET and NORTH have enumerated them as premonisary of convulsions, which they doubtless most frequently precede; but in a great many cases convulsions hold the same relation to inflammatory and febrile attacks in infants, as rigors do to the same diseases occurring in adults; and hence these signs must often be common to both, and also to some other infantile diseases. This is shown by their frequency in remittent fever, and other inflammatory irritations of the gastro-intestinal mucous surface of children.

21. *B. The paroxysm of convulsions* in children is similar to that occurring in adults. In the most severe cases, there is a violent, involuntary, and alternating or convulsive action of all the voluntary muscles extending to some internal or involuntary parts; in which, indeed, the affection often seems to originate, or which appear to be those first affected. In plethoric infants, the face and scalp are tumid, reddened, and subsequently livid; the eyes are distorted and staring, or turned up beneath the upper eyelid, leaving only the sclerotic visible; the respiration is impeded and laborious, but very rarely attended by foaming at the mouth and protrusion of the tongue, unless the paroxysm be epileptic. The whole surface often becomes slightly violet-coloured towards the close of the fit, and the hands tumid. In many instances, particularly in weak or exhausted children, the seizure is much less violent, the countenance being pale and collapsed, and the convulsions more clonic. There are sometimes only twitchings of the muscles of the face, and alternate contractions and relaxations, or rapid shocks, of a few parts, or of only one half of the body, or of various parts in succession, with slight blueness about the eyes and mouth; but more frequently the whole body is convulsed, and the countenance distorted and haggard. The mental faculties, and general sensibility, in the slight or clonic convulsions, are generally not interrupted. They are also, however, frequently obscured, but only during the height of the paroxysm; and sometimes even entirely abolished in the severe recurrent convulsions attending cerebral disease — the *eclampsia* of some authors (§ 24.).

22. *C.* The utmost diversity exists as to the *duration* and *recurrence* of the fit. In some cases it is only momentary, or of a very few minutes' duration. In other instances it continues for several hours, with frequent remissions. It may likewise cease, and shortly afterwards return, and thus subside and recur at short but irregular intervals for several times, and at last cease altogether, or terminate life. Or the first seizure may be so severe as to be fatal. These recurring fits are often at last attended by insensibility, which is not altogether, or even not at all, recovered from in the intervals. This form of the malady is more common in children than in adults, excepting as it occurs in the puerperal states, or towards the termination of tumours and abscesses in the brain. As the convulsive movements constituting the fit become less and less violent and constant, and respiration fuller and freer, the natural appearance of the surface returns, and the child is enabled to cry; it afterwards falls either into a refreshing sleep, or, if the convulsions have a cerebral origin, into a stupid or lethargic state of various duration.

23. *D.* There is a species of spastic or tonic convulsion, which is but rarely met with, affecting chiefly the extremities. It seems more nearly allied to spasm than convulsion, into which, however, it sometimes passes; and occurs, chiefly,

in very young children, and in those approaching to puberty, particularly those who are nervous and irritable. I have seen but few instances of it; but it has more frequently been seen by MM. Jadelot and Tonnéllé. It consists of rigid contraction of the upper and lower extremities, of the former only, but more frequently of both. The hands are slightly bent on the forearm, and the feet are stretched in the same axis with the leg. The spastic action of the muscles continues for several hours, or even days, then ceases, and returns, and often thus recurs frequently at short intervals. The intellectual faculties, the general sensibility, and the muscles of the trunk, are not affected; and the pulse and natural functions not materially disturbed. The cases of it which have occurred in my practice, have all been evidently owing to the irritation of worms, or morbid matters in the alimentary canal, or to dentition.

24. *E.* Another form of convulsions is much more frequently met with in children, to which the name of *Eclampsia* has been given by Rosen, Sauvages, Brachet, and others, and which has been considered as infantile epilepsy by some, and, with more justice, by others, as convulsions occurring in the more robust children as a consequence of cerebral congestion of an active form. But it differs from epilepsy, in the absence of foaming at the mouth, by the irregular and frequent recurrence of the attack, by its longer duration in most cases, and by its uniform connection with evident signs of fulness of blood, or acute disease in the brain. This form is seldom preceded by precursory symptoms of any continuance. The child cries, its face and scalp become red and tumid, it loses consciousness, and is seized with violent convulsions, or with tremor and rigidity, or a succession of spastic shocks of the limbs. In a few seconds, or minutes, or even hours, the seizure subsides; but is generally renewed at short intervals; the head remaining hot and pained after each return of the fit, which never terminates by a critical sleep of short continuance, and in restoration of the healthy functions, as in epilepsy, unless assisted by active treatment, but is frequently followed by profound stupor or complete insensibility. From the foregoing it will be evident that *eclampsia* is merely a more severe form of convulsion, differing from others only in respect of the severity or tonicity of the muscular contractions, the more complete abolition of sensibility and of the cerebral functions, and its more uniform dependence upon congestion of the brain and its consequences (§ 21.). The eclampsia of children is in every respect similar to the convulsions of the puerperal states (§ 29.).

25. *F.* There are certain phenomena connected with the accession and the course of the convulsive fit that require attentive observation, as they furnish indications of the pathological state occasioning the seizure, and, indeed, form the basis for rational indications of cure. These have intimate relation to the origin of the paroxysm either in repletion or inanition — in congestion, or in anæmia of the cerebro-spinal masses; in which latter the convulsions of children not infrequently originate, as shown by Dr. M. Hall, and subsequently by others, and as I have had frequent opportunities of remarking for many years. When the convulsion is attended with a congested state of the circulation in the head, it will generally be readily recognised, both from the history of the case, and from the premonitory and concomitant symptoms. The warm, tumid scalp and face; the flushed countenance; the contracted pupils and suffused conjunctiva; quick, full, or hard pulse, particularly of the carotids; are evident signs of an excited circulation in the brain, not infrequently either accompanied with, or running into inflammatory action. When the countenance and scalp are swollen, full, dark, or livid; the fontanelle elevated and tense; the eyes distorted, prominent, vacant, and stupid; the pupils dilated; the veins of the head and neck large and dark; the pulse slow, irregular, or oppressed; the respiration laborious; the vessels within the cranium are evidently congested. Dr. John Clarke, and many other writers, impute the convulsions of children to irritation or organic change, either directly or indirectly induced in the brain or its membranes, particularly in the arachnoid, according to M. Brachet. We shall see, when we come to treat of the proximate cause of convulsions, that, although this may be most frequently the case, it is by no means universally so. For we occasionally meet with convulsions consequent upon exhaustion, and even anæmia, as in the last stages of chronic diarrhœa or other diseases; and after large or repeated depletions, where there is no evidence of irritation of the arachnoid, or of organic change. In many such cases there may occur notwithstanding, especially during the height of the paroxysm, temporary and slight congestion of the head, as shown in the article Blood, (§ 54 — 61.); but, still, evidence of *anæmia* of the brain, and, indeed, of the general system, will be furnished in the depressed and relaxed fontanelle; in the pale, collapsed, and pinched features; in the retention of consciousness and unimpaired general sensibility; in the bloodless and dull appearance of the conjunctiva and cornea; in the state of the pulse in the carotids, and the low temperature of the head; and in the pale, shrunk, wasted, and often bloodless condition of the whole surface.

26. There is a disease to which infants are liable, that consists of a spasmodic contraction of the muscles of the larynx and of the extremities, and which has been confounded with convulsions, or with spasmodic croup, and variously denominated. As the muscles of the larynx are chiefly affected, and as the disorder consists of spastic rather than convulsive action, it is treated of in a separate article. (See Larynx, Spasm of.)

27. iv. Puerperal Convulsions. — Convulsions may come on (*a*) during the latter months of pregnancy; (*b*) during parturition; and (*c*) during the first fortnight after delivery. They may be partial or general, most commonly the latter; and they may assume various shades of tonicity, from a state of tetanic violence to the more clonic form, characterised by alternating contraction and relaxation; but they usually present very nearly the same phenomena as eclampsia — being attended by loss of consciousness, and recurring paroxysms, between which sensation is not restored.

28. *A. Premonitory symptoms* commonly usher

in the seizure; but, in some cases, they are either absent, or so brief in duration, or so slight, as to evade detection. **Chaussier** thinks that they are scarcely ever wanting altogether. The patient usually complains shortly — sometimes for several days — before the attack, of lassitude, depression, and a feeling of indisposition which she cannot well describe; frequently of disorder of the stomach; often of weight or pain in the head, or of drowsiness, vertigo, and sparks, or various dark or bright objects, floating before the eyes. These symptoms are renewed at intervals during a day or two, and are occasionally attended by embarrassment of speech. To these usually are superadded, shortly or just before the seizure, a change in the expression of the countenance; partial or occasional failure of sight, or loss of sight; sometimes loss of hearing; haggard, vacant, and fixed state of the eyes, with a dilated pupil; ringing or other noises in the ears; sometimes most acute and splitting pains in the head, with a flushed neck and face; generally sickness, pain, oppression and anxiety at the stomach; thirst; a full and quick pulse; subsequently a slower pulse; and swelling of the neck and countenance; tetanic stiffness of the wrists; cramps in particular muscles or parts; twitchings of the muscles of the face; shocks or shudderings through the frame; altered respiration; loss of consciousness; and all the phenomena constituting the developed seizure. Dr. J. F. **Osiander** states that he has seldom observed a tumid state of the face and hands wanting as a premonitory symptom. If the convulsions occur during parturition, the pains often become feeble and frequent before the seizure.

29. *B. The complete seizure.*— To these succeed involuntary contractions of the muscles of the face and jaw, instantly followed by spasmodic succussions, or general convulsions of a violent or tonic character; sometimes approaching to tetanic, but commonly closely resembling eclampsia; or the universal convulsions of the epileptic or hysterical paroxysm. The respiration is laborious, imperfect, sonorous, and hissing, — frequently with foaming at the mouth, — and the tongue is often protruded; the eyes are injected, prominent, fixed, staring, or rolling; the countenance and head tumid, red, or livid; the limbs are strongly convulsed, and tossed about; the heart beats strongly; and sensibility and consciousness are entirely abolished. After a short time the convulsion subsides; respiration becomes less laborious, and the countenance less livid; but the comatose stupor continues, sometimes with slightly stertorous breathing; when, after an indefinite, but generally a short, interval, the spasmodic succussions and general convulsions return as before, or with slightly modified severity or duration, and subside into stupor as before. Thus they may recur two or three times — more frequently, several or many times — when the patient either quickly awakes, unconscious of what has passed, as if from a slumber; or passes into a more comatose state; or recovers partially; sight and hearing, or speech, or both, being lost for a time. Or she may experience some one of the unfavourable terminations hereafter to be noticed.

30. It may be generally remarked, that, upon the accession of puerperal convulsions, a flux of blood takes place to the head and superior extremities; the veins of the lower limbs becoming proportionately empty, and the pulsation of their arteries being comparatively small and weak. The worst forms of the attack are often attended by a firm spasmodic constriction of the cervix uteri, preventing the expulsion of the fœtus. M. **Menard** states, that, in the majority of cases of death by convulsions previous to delivery, the child has been found dead, the contraction of the features and extremities denoting that it had participated in the affection of the mother: this, however, wants confirmation. In some instances, the child has been unexpectedly born during the violence of the convulsions, as if expelled by them with unwonted celerity.

31. *C. Modifications.* In persons of a nervous temperament, local pain or irritation, or even exhaustion alone, may induce that state of cerebral affection upon which convulsions are consequent, without the supervention of plethora, and active congestion of, or determination of blood to, the brain characterising the great majority of cases. In these persons, the seizure is sometimes preceded by sinking, leipothymia, or fainting; the countenance is neither tumid nor livid; the eyes and face are unsuffused, but wild — often sparkling, staring, or rolled irregularly; the pulse is small, hard, or constricted; the urine is frequently copious and pale; and the agitations and tossings of the limbs greater, but less rigid or spastic, than in the mixed epileptic and apoplectic forms described above. In these cases, there is evidently cerebral irritation, or erithism; and, during the paroxysm, abolition of consciousness: but the patient generally either partially recovers her sensibility between its exacerbations or recurrences; or awakens out of this state entirely restored, and without experiencing any of those sequelæ which are left by the more congestive attacks. In other instances, seizures occur, presenting characters intermediate between these; but the first described state is by far the most common. From this it may be inferred that convulsions, in any of the three periods connected with child-bearing, will evince modified phenomena, according to the constitution, temperament, habit of body, predisposition, and previous ailments of the patient. In the plethoric, epileptic, irritable, sanguine, and robust, it will present the characters of eclampsia or epilepsy — the most common — or of apoplexy or coma; and in the hysterical, the nervous, the delicate, &c., it will assume these now noticed, which approach those of a severe hysterical attack. The convulsions which come on in the puerperal states from large losses of blood, are either of this kind, or of one closely resembling it, or intermediate between it and the epileptic.

32. v. Convulsions associated with other Manifestations of Disease.— Convulsions may occur on the *invasion*, during the *course*, and at the *crisis* or *decline* of a great number of acute diseases, particularly in children under eight years, about the period of puberty, and in females of a nervous and susceptible constitution. Their connection with irritations, &c. in the *prima via*, and with organic diseases in, or affecting the large nervous masses, is considered at another part (§37. 44, 45.); but their association with some other maladies require a more especial notice in a practical point of view. *a.* The *invasion* of various

acute distempers is often attended by convulsions. Indeed, in some of the severe diseases to which young children are liable, particularly the exanthematous fevers and inflammations, convulsions usurp the place of the cold stage or rigors which usher in these diseases in adults, and are generally preceded by coldness of the surface. When occurring in this manner, they should be regarded as indicating one of three things, viz. a morbid susceptibility of the nervous system, and predisposition to disease in the cerebro-spinal axis; or an approaching developement of febrile reaction and of eruption, if the patient be of a sound constitution; or else an imperfect evolution of both, with a disposition to visceral irritation, inflammation, or effusion, particularly of the brain or abdominal viscera, if the habit of body be in fault, or if there exist any hereditary disposition, or vice remaining after previous disease.

33. *b.* The *course* of various diseases sometimes becomes associated with occasional or recurring convulsive seizures; often of a partial, or of an irregular, peculiar, or anomalous character; but frequently, also, such as those described under general convulsions (§ 12, 13.). Children, and females about the period of puberty, are most liable to these complications. We observe these seizures in hooping cough and croup; in the remitting fevers of infants; in mania, and febrile insanity; in inflammatory and numerous organic diseases of the brain (§ 37. 44. 45.) and spinal chord; in verminous complaints, and other disorders of the alimentary canal; in organic lesions and calculi of the kidneys and urinary bladder; and in states of nervous and vascular excitement or irritation of the female organs. In all these complications, either active congestion or determination of blood to the head, or irritation of the cerebro-spinal axis and membranes, or both these states, may be presumed to exist; active congestion being occasioned by impeded return from, with increased impetus of the circulation to, the brain and medulla oblongata; irritation of these parts being generally propagated thither from some portion of the organic nervous circle, and through the medium of this circle, in which it had been primarily excited. We not infrequently observe convulsions attended or followed by *mania* and insanity, or even supervene in the course of these mental disorders. When this is the case, the convulsive seizure is commonly of a tonic and acute form, and approaches nearly to eclampsia and epilepsy, constituting the *maniacal convulsions* of authors. The convulsions which occasionally are observed in females, in connection with irritation of the sexual organs, are evidently owing to the propagation of disorder, through the medium of the organic or ganglial, to the spinal nerves, or to the chord itself, or even to the brain; as well as to the extent to which these various parts of the cerebro-spinal system are thereby influenced; and the various forms which the convulsions thus originating commonly assume, are to be imputed to the existing state of local or general plethora, or to the degree of determination of blood to the head with which the superinduced irritation is attended. When we reflect upon the connection of the organic nerves with the spinal, and especially on the mode of that connection with the brain itself and the rest of the cerebro-spinal system, we shall not be surprised that irritation of the extremities of the organic nerves, either in some one of the female organs, or in some part of the *primæ viæ*, excites in one person, according to peculiarity of temperament, hereditary predisposition, habit of body, or state of vascular plethora, convulsions of a spastic or tonic character in the limbs and trunk, the cerebral functions being undisturbed; in another person, convulsions either of a clonic or irregular form, consciousness also being retained; or either of these forms, or both of them variously or singularly mixed, with partial or complete deprivation of sense and mental manifestation, or with a comatose or maniacal delirium superadded. Nor should it be a matter of wonder that irritation thus originating gives rise to various other abnormal nervous and muscular phenomena, such as catalepsy, ecstasy, hysteria, &c.

34. *c.* Convulsions sometimes also usher in the *crises* of fevers and other acute diseases. This occurs most frequently in delicate or hysterical females, the abnormal contractions assuming a variety of forms, and often an hysterical character; but it also not infrequently is observed in the male sex, especially in young and delicate persons. This association of convulsions is generally dependent upon a severe affection of the brain in these fevers, and attended by either coma or delirium; and although they may indicate a favourable change, particularly when accompanied with, or immediately followed by, other critical phenomena, or when they put on the true hysterical form, yet they may be the outward signs of an exasperation of the cerebral or cerebro-spinal affection, particularly when the mental faculties and general sensibility are not soon afterwards restored. Other morbid associations, as with worms, diseases of the brain and spinal chord, &c., may be considered as causes of convulsions rather than complications.

35. II. Diagnosis. — Simple convulsions may with difficulty be distinguished from *epilepsy* and *hysteria*. They cannot readily be mistaken for *tetanus* or *rabidity*. There are many cases, which the nature of the exciting cause, and the history of the case, show to be different from true epilepsy, and yet they cannot easily be distinguished from it during the height of the paroxysm; and the remark applies equally to the hysteric fit. In fact, convulsions present so many and so slight grades of difference, as to the spastic contraction of the muscles, and the frequency and rapidity of its alternation with relaxation, — as to the presence of, or immunity from, cerebral disorder, as well as to the nature and extent of such disorder, — are so intimately allied in respect of their causes, of the particular system of the frame upon and by which these causes produce their sensible effects, and of the nature of these effects as far as they become symptoms or signs of the particular lesion which occasioned them, that the difficulty of diagnosis is very great in many instances, excepting to the acute and experienced observer, whilst it is sufficiently easy in others. *a.* Generally, however, simple convulsions will be readily distinguished from *epilepsy*, by the retention of consciousness and general sensibility in the former, excepting in the height of the paroxysm in the severer or more plethoric cases, as in eclampsia and puer-

peral convulsions, in which both are lost; by the general absence of the consecutive sleep or sopor of epilepsy; by the irregular and frequently recurring form of the seizure; by what is known of its origin and connection with obvious causes, and by the mode of its attack and of recovery from it. There are also various symptoms which, although common to eclampsia, puerperal convulsions, and *epilepsy*, are yet peculiarly characteristic of this last; and we find, in addition, other phenomena which simple convulsions seldom present, particularly the frightful scream on the accession of the epileptic fit, the antecedent aura or peculiar premonitory signs, the very sudden and unexpected seizure when the aura is wanting, the expulsion of the seminal and prostatic secretions, as well as of the alvine excretions; the more frequent occurrence of foaming at the mouth, and severer affection of the respiratory muscles; the more leaden appearance of the countenance, and the more common recurrence of the paroxysm at a stated time, than in convulsions, particularly after the first sleep, or when the patient awakens or is rising in the morning. (See EPILEPSY—*Diagnosis.*) β. Convulsions are readily distinguished from *hysteria*, by the antecedent copious discharge of pale urine, the globus hystericus, and the borborygmi; and by the alternate crying and laughing attending the seizure of the latter. Some instances of simple convulsion, arising from irritation of the female organs, will, however, very nearly approach, if not altogether run into, the hysterical character; as we also see many cases of puerperal convulsion differing but little from epilepsy, excepting in the frequent recurrence of the paroxysm in the former before the patient has recovered from the sopor consequent upon the antecedent fit, and in one or two of the diagnostic signs noticed above. γ. The continued or permanent nature of the spasms in all the forms of *tetanus*, and the absence of any tendency to obscuration of the general sensibility and mental faculties, during the whole unremitting duration of this dreadful disease, are sufficient diagnostics between it and convulsions. δ. *Rabidity* cannot be mistaken for this affection, if the history of the case, the uncommonly increased sensibility of the whole frame, the dread of fluids, and unimpaired cerebral functions, characterising rabies, be attended to; for, although convulsive seizures occur frequently in it, they are produced by so slight external or mental causes — by every attempt at swallowing liquids — that their nature and origin cannot be for a moment doubted. (See RABIDITY.)

36. III. TERMINATIONS OR CONSEQUENCES, AND PROGNOSIS. — *A.* Convulsions, in any of the forms now placed before the reader, may *terminate*, (*a*) in health; (*b*) in some other disease; or, (*c*) in immediate dissolution. *a*. Their *termination in health* may be marked by no peculiar phenomenon; beyond the non-recurrence of the seizure. In other cases they are followed by critical evacuations, particularly hæmorrhage from the nose, mouth, or ears, after which they may never recur, or which may produce an immunity from them for a time. Vomiting and diarrhœa, or the accession of the catamenia, may likewise prove critical.

37. *b*. They often are *followed by other diseases;* or rather the original disorder or change of structure, of which convulsions are merely a part of the sensible and outward signs, may, from its increase, or extension to adjoining parts, occasion other or additional phenomena more or less intimately allied to convulsion, as palsy, apoplexy, coma, loss of speech or of sight or hearing, chorea, or mania, delirium, idiotcy, &c., each of which may pass into the other, or be variously associated with one another. Thus loss of sight, hearing, speech, and idiotcy, may be the consequences in the same case. Also, either of these consecutive phenomena may arise from the cerebral congestion, and its effects, produced by the frequent recurrence or by the severity of the fit, particularly when the respiratory functions are much impeded in it, and the system is plethoric and relaxed. My limits will not admit of illustrations of these facts, either from my own experience, or from the other sources which are referred to at the end of the article; but they are of common occurrence, and may, after continuing for a longer or shorter time — in some cases for many years — in others for a very short period, either be recovered from, or terminate existence. In some cases, convulsions are followed by a state of leipothymia, trance, or complete syncope, which, when profound and continued, may be mistaken for dissolution, and endanger premature interment. There is reason to suppose that, in some countries where interment usually follows death at a much shorter period than in Great Britain, this dreadful fate has overtaken the patient. In other instances, lethargy, or torpor, terminates the paroxysm, which, in rare instances, has been of long duration, and also may be mistaken for death. Whilst the convulsions of childhood more commonly give rise to, or terminate in, loss of one or more of the functions of sense, in chorea, in idiotcy, or in hydrocephalus; those attacking adults are more disposed to pass into either apoplexy, coma, palsy, or mania: and whilst the convulsions of the former class of subjects are more frequently the consequence of irritations affecting the abdominal viscera, those of the latter, excepting in females, are more generally the result of disease within the cranium or spinal column, often at a certain stage of its progress.

38. *c*. Their *termination in death* takes place either through the intervention of one or more of the diseases noticed above as their consequences, or, more directly, from the extension of convulsion or spasm to the respiratory muscles, inducing asphyxy, or from an overwhelming congestion or effusion of blood in the brain. This sudden unfavourable change more commonly occurs in puerperal convulsions than in other forms, excepting when they proceed from abscesses or tumours within the cranium. Death may also occur from accidental suffocation during the paroxysm.

39. *B*. The PROGNOSIS of convulsions depends chiefly on what is known of their *causes*, on the antecedent and consecutive phenomena, on the history of the case, and the degree in which the functions of the brain and nervous system are affected during and after the fit. *a*. If the convulsions occur in *children*, without fever or any primary or cerebral disturbance, and apparently from worms, disorder of the prima via, &c., a *favourable* opinion may be entertained.

But when they are preceded by head-affection, by fever, followed by strabismus, stupor, or loss of one or more of the functions of sense; when they are prolonged or recurrent; or are followed by signs of any of the unfavourable terminations noticed above, much *danger* should be apprehended. Indeed, all cases depending upon cerebral disease are attended by more or less danger, which in some instances become most imminent, particularly when the symptoms of hydrocephalus are present. *b.* In *adult persons* the prognosis is equally *unfavourable*, when the affection is evidently the result of cerebral disease, or of organic changes — and when the fits become more and more frequent, or severe, with more marked cerebral disturbance either attending upon or following them. On the other hand, when they are symptomatic of disorders of the prima via, or of the generative organs, a *favourable* opinion may be entertained. *c. Puerperal convulsions*, however, should never be considered devoid of *danger*, more especially when they occur after delivery; or in consequence of great exhaustion of vital power, or of uterine hæmorrhage. When they are slight, are unattended by stertorous breathing, or by paralytic or apoplectic symptoms, and when parturition is so far advanced as to readily admit of its completion by art, less danger may be feared. But the *prognosis* of convulsions generally must be inferred from a careful review of the diversified circumstances of individual cases, especially in respect of their remote and efficient causes, and of their disposition to terminate in either of the ways pointed out.

40. IV. Appearances on Dissection of fatal Cases. (See Brain, § 4—133.), Epilepsy, and Spinal Chord.

41. V. Remote and efficient Causes. — i. *The remote causes of convulsions* are numerous; but they often require a certain *original* or *acquired predisposition* of system to ensure their operation; and various influences which may only predispose to them in some persons, may even excite them in others. *A. Predisposing.* There is every reason to suppose that the offspring may derive constitutional predisposition to convulsions from the parents. Persons of a nervous and irritable temperament, — of a delicate frame, and largely developed head (Desessartz), — of a relaxed and soft fibre, and plethoric, vascular system, — children whose fontanelles are very late in closing, — those who are naturally of a quick, sensitive, and unstable disposition, and whose physical and moral constitutions are readily impressed, — are predisposed by original conformation. Those infants who have experienced injury of the cranium during parturition (Smellie); persons who have early, prematurely, or inordinately indulged in venereal pleasures — who have placed no restraint on their passions, particularly anger, — who have become debilitated by any cause (Autenreith), — who have had their cerebral organs unduly and too early excited, and before the process of developement was sufficiently far advanced; the present state of civilisation and precocious mental improvement; the greater irritability of the system accompanying the epochs of dentition; the irritable and plethoric states attendant upon pregnancy; habitual determination of blood to the head; previous attacks of convulsion, either before or after puberty, or in a former pregnancy; attempts to conceal pregnancy, and the mental distress and shame attending it in unmarried women; exhaustion of nervous or vital power by increased discharges, long continued pain, or want of sleep; all luxurious indulgences; too much sleep; inanition and want; prolonged lactation; fluor albus, &c.; and certain electrical states of the air, by which the nervous system is influenced, and rendered more susceptible of impressions and excitement; are the chief causes which generate a predisposition in the frame. It has been remarked by Dr. Ramsbottom, and other writers, that puerperal convulsions were most frequently produced during warm electrical states of the atmosphere.

42. *B.* The *exciting causes* of the various forms of convulsion are very numerous; and they act in different ways in producing their effects. I have already stated, that irritation of a part of the organic or ganglial nervous system will be transmitted by the communicating branches to the spinal nerves, and produce convulsive actions of the muscles they supply, without the brain experiencing any evident lesion; whilst, in other cases, the irritation may be conveyed to the brain, either directly by the organic nerves, or through the medium of the spinal chord, the cerebral functions suffering accordingly. But irritation or organic change of any of the parts contained within the cranium will also occasion convulsions, the general sensibility and mental manifestations being then more or less obscured or perverted during the paroxysm or subsequently. These facts, which might be illustrated by numerous cases, the history and results of which I have attentively observed, naturally point to a division of the causes, *first*, into those which act upon some portion of the organic nervous circle, or the viscera which it supplies; and, *secondly*, upon the cerebro-spinal system itself. But, although it is useful to make this distinction, particularly for practical purposes, yet it should not be overlooked, that irritations affecting the former would rarely be followed by convulsions, unless the latter possessed a marked disposition to disease, as far as regards increased susceptibility and proneness to experience alterations from the healthy condition of its circulation.

43. *A.* The exciting causes which act more immediately upon the *organic nervous system*, and through it upon the spinal nerves or brain, or both, are the following: — *a.* In *infants* and *children*, the retention of the meconium; a morbid state of the umbilical chord; unwholesome milk, or improper feeding; acid or acrid sordes, and various diseases of the alimentary canal; an overloaded stomach; suppression or retention of the urine; accumulated flatus, or morbid secretions, and the presence of *worms*, occasioning irritation of the bowels; the ingestion of acrid substances — as very irritating purgatives (Gohl and Lentilius), or emetics (Riedlin), — acrid enemata; noxious or indigestible substances taken as food; acidity of the prima via; dentition at either of its epochs, particularly cutting the eye and molar teeth; the irritation of pained or carious teeth; and calculi in the urinary organs, &c. *b.* In persons about, *or subsequently to, puberty*, and occasionally in children, organic diseases of

the stomach, bowels, or collatitious viscera; affections or lesions of the heart; constipation, colic, ileus, and intus-susception; incarcerated or strangulated hernia (Graaf and myself); organic change of the kidneys, and suppression of urine; manustupratio or inordinate sexual intercourse; and nervous and vascular excitement, or other diseases of the female organs, particularly the ovaria and uterus. *c.* In *puerperal females*, a loaded stomach, or disorder of this organ brought on by indigestible or unsuitable articles of diet, particularly shell-fish (Clarke); rapid or premature distension of the uterus during pregnancy; long continued and exhausting labour; excessive, frequent, and inefficient pains; distension of the urinary bladder during or after parturition; a loaded state of the bowels; excessive depletion or flooding; venereal indulgences during the last two months of utero-gestation.

44. *B.* The *causes* which act more directly on *the cerebro-spinal nervous system* are, *a*, the improper exhibition of narcotics, and of spirits and various quack medicines, by the lower classes, to *infants* and *children*; the admission of a strong light, or the impression of loud noises, on very young infants; the continuance or excess of pain; injuries received on the head during or subsequently to birth; fear, and sudden fright, or fearful dreams. *b.* In *adults* more especially, and in children also, the most common causes of this description are, the influence of imagination and imitation; the action of the sun's rays on the head; excessive mental labour or anxiety; extreme bodily sufferings, or long watching; injuries of the brain, spinal chord, or nerves; irritation of nerves by tumours, abscesses, or by ligatures in operations, or injuries of them by wounds and accidents; incipient curvatures of the spine (Wichmann, Bonet); the impression of excessive or long continued cold, or of a cold bath; the influence of particular odours on some constitutions; the abuse of spirituous liquors; the influence of various poisonous substances on the nervous system, belonging to the animal, vegetable, and mineral kingdoms, as nux vomica, and nearly all the class of narcotics; deleterious gases and metallic fumes, as the nitrous oxide, sulphuretted hydrogen, &c., the vapours of mercury and lead; and the irritating and inflammatory operation of many mineral preparations and acrid vegetables (see Poisons); all emotions of the mind which excite the nervous power, and determine the blood to the head, as joy, anger, religious enthusiasm, excessive desire, &c.; or those which greatly depress the nervous influence, as well as diminish and derange the actions of the heart, as fear, terror, anxiety, sadness, distressing intelligence, frightful dreams, &c.; numerous lesions of the encephalon or its membranes, particularly effusions of fluid, abscesses, tumours, ossific deposits, and various other adventitious formations—indeed, nearly all the organic changes described in the articles on the Brain, Epilepsy, and Spinal Chord; also exhaustion from previous disease, particularly by large losses of blood (Schroeder); inanition and want (Amatus Lusitanus); the erect position suddenly assumed; lightning (Grapengiesser); abscesses about the neck; the suppression of eruptions and discharges, particularly on the head or from the ears; the syphilitic poison; and repulsion of gout or rheumatism. *c.* In *puerperal females*, many of the causes now mentioned are especially productive of convulsions, particularly anxiety or distress of mind in unmarried females; violent straining during labour; and sudden changes from the horizontal to the sitting or erect postures.

45. ii. The *efficient causes* have been partially alluded to. Their nature may be in some measure inferred, from what has been stated above. It seems evident, from a careful consideration of the exciting causes, of the character and progress of the symptoms, and the lesions usually detected on dissection, that convulsions arise from several pathological states, the grosser or more palpable parts of which only we are enabled to recognise by the senses; and that, in addition to these, a certain susceptibility of the nervous system, particularly of the cerebro-spinal centres, is requisite, nevertheless, to the full developement of the seizure. It is extremely probable that convulsions frequently arise from some considerable change in the state of the circulation within the cranium; and that such change may be either active cerebral congestion, — in some cases connected with general plethora, but in others not thus associated, and, even in a few, accompanied with marked deficiency of blood, — or local or general anæmia. Moreover, it may be presumed that the seizure very often is accompanied with but little disturbance of the cerebral circulation or functions at its commencement; and that it chefly depends upon irritation, in some manner induced in the organic nerves, and, through them, in the spinal nerves, either partially or generally. We have no proof of the circulation of even the spinal chord or its membranes being disordered in these cases, although it may be affected in convulsions, either primarily or consecutively. In cases which more manifestly proceed from disease within the cranium, and that of an organic kind, as from tumours, abscesses, aqueous effusion, &c., it by no means follows that the circulation in the brain is generally, or even at all, either accelerated or congested, although these lesions may safely be assumed in many instances. In some cases even of organic change, the general amount of circulation in the head seems, as far as we can judge from symptoms, much below the natural standard, and yet convulsions will supervene; whilst in others, signs of inflammatory action of the membranes are apparent. In many cases, moreover, judging from the states of pre-existing disease, from what is known of the operation of various causes, and from the symptoms connected with the head, — the weak and small pulsation of the carotids, the antecedent fainting or leipothymia, the low temperature of the scalp, and pale, sunk, and pinched features, — it may be inferred that the vital endowment and the circulation of the brain are momentarily deficient both in activity and in quantity.

46. Therefore, while I subscribe to the justice of the aphorism of Hippocrates, that convulsions arise from repletion or inanition as respects the circulation within the cranium, I would qualify it, and add, that they often originate thus, but that either of these states forms a part only of the changes that produce them, even when most irrefragably present, — that in many cases the circulation in the brain is not materially disturbed, whilst the spinal nerves are affected either by irritation conveyed to them from the organic nervous system or from the spinal chord itself, more

frequently the former, — that even when the brain is disordered, general convulsions will arise only when the disorder extends to, or influences the parts more immediately related to, the locomotive actions of the body, as the spinal chord or its membranes, — and that we cannot contemplate the origin of convulsions in any way, and leave out of view changes primarily induced in the organic nervous or ganglial system — which changes will more readily produce, than be produced by, disordered circulation in the cerebro-spinal organs. We know that the movements of the fœtus in utero are automatic — are the consequence of irritations affecting the organic nerves, extending to the spinal nerves, and, through them, inducing motions of the limbs. To the production of these, any change in the brain or spinal chord is not required; and a great many cases of convulsion have a similar origin, the difference being only as to the grade of irritation relatively to the susceptibility of the patient, and to the effect produced. As to the opinion entertained by the older humoral pathologists, from GALEN to WILLIS, that a morbid state of the fluids also occasion convulsions, some importance may be attached to it. We do not, however, find convulsions much more prevalent when the blood is manifestly morbid, unless in those cases where a previous, and, at least, an equal change has been produced upon either the organic, or the cerebro-spinal nervous systems. The convulsive movements that occur in common and pestilential cholera, in malignant fevers, in rabidity, and in organic lesions of the kidneys, with suppression of urine, are proofs of this position. That, however, a morbid state of the blood sometimes constitutes a concurrent proximate cause of certain diseases, in which convulsions either incidentally occur, or form a part of the circle of advanced phenomena or effects, may be admitted, in the absence of sufficient evidence to the contrary; for, when the blood itself is primarily changed, we may with reason infer that convulsions will sometimes manifest themselves as a part of the effects thereby produced upon the nervous system; but I believe that convulsions seldom arise from this cause only.

47. VI. TREATMENT. — i. OF CONVULSIONS GENERALLY. The means of cure in all cases of convulsions, are directed with the view, 1st, of subduing the fit, when called to a patient labouring under it; and 2d, of preventing its return. *A.* To *subdue the paroxysm*, it is necessary to have prompt recourse to active measures: but these should not be employed indiscriminately, and without taking quick cognizance of the cause, and the existing pathological states, as far as they may be readily ascertained. The circumstances principally to be observed by the practitioner, are the presence or absence of active cerebral congestion and sopor, the existence of general vascular plethora, the temperature of the head and lower extremities, the pulsation of the carotids, and the character of the countenance and of the convulsive motions. These may be ascertained in a very few moments, and at the same time that enquiry is being made into the cause of the seizure, and the peculiarities of the case, as respects the age, constitution, and habits of the patient.

48. *a.* A person in convulsions ought to be placed so as to breathe *an open cool air*, and to facilitate the restoration of one of the earliest functions disordered; and no more attendants be permitted than are absolutely necessary. Those susceptible of, and liable to, nervous affections, should not be allowed to remain in the same room, or even in the same house, with the patient while in the fit. — *b.* When the habit of body and the cerebral symptoms, &c. present no contra-indication, *general or local blood-letting*, or both, should be resorted to, and carried as far as circumstances may warrant. When the cerebral congestion is very active and extreme, the jugular vein may be opened; but the depletion should never be pushed too far, with an expectation of stopping the convulsions; nor should it ever be carried to deliquium, for the system may be thereby injured, and a return or immediate recurrence of the seizure be favoured by it. *Revulsive bleedings*, as from the feet while they are held in warm water, may be preferred, if the seizure be connected with difficult or suppressed menstruation. *Local depletions*, in other instances, are best practised by cupping behind the ears, particularly in children, and upon the nape of the neck, and between the shoulders. In other instances, when the brain is not affected, — when the head is cool and the carotids are pulsating neither more fully nor more strongly than natural, — the state of the spinal column should be carefully enquired after, by pressing a warm sponge along and between the vertebræ; and the abdominal regions and the evacuations ought to be daily examined. If signs of inflammatory action exist in either of these quarters, particularly if they be connected with plethora, general and local depletion — preferably the latter, when plethora is wanting — should be resorted to. But there are many cases, especially those produced by copious evacuations, by inanition, and the exhaustion of painful and protracted disease, where depletion would be most injurious; and there are intermediate grades, in some of which local blood-letting might be either beneficial or of no advantage, according as the case approaches nearer to the one extreme than the other. When the convulsions are *partial*, then local depletions are to be preferred.

49. *c.* There are certain states of convulsion, in which it at first seems difficult to determine as to the propriety of resorting to blood-letting in any way. One of the most common of these, is that characterised by a pale and somewhat sunk countenance, and by tonic convulsions. This appearance may mislead the practitioner, if he do not examine carefully into other symptoms. If, in addition to these, the carotids pulsate strongly, the temperature of the head be increased, the pupils contracted, and the brows knit, we should suspect inflammatory irritation of the arachnoid — notwithstanding the absence of all plethoric or sthenic signs — and resort to depletions, and the means about to be noticed. (See also BRAIN — *Treatment of Inflammation of its Membranes.*) Another state sometimes occurs, with very violent general convulsions; a broad, open, throbbing, and frequent pulse; pale countenance and surface, often with sopor or delirium, or both. These symptoms may mislead the inexperienced, and depletions — occasionally the very cause of the mischief — may be improperly employed to relieve it. But when the history and symptoms of the case are more minutely examined, we shall

find precisely that state which is described in the article BLOOD (§ 53—60.), and that, instead of congestion, there is general anæmia, with cerebral irritation, combining with the physical condition of the brain, to determine to it the greater part of the blood in the system. In other cases, there is apparently anæmia of the brain, at least at the commencement of the fit, and either consciousness is retained, or it is lost from the state of the cerebral circulation. These forms of seizure may be called *anæmial*; inasmuch as they arise either from a general deficiency of blood, or from anæmia of the brain, although the vessels of this organ soon become partially congested from the impeded respiration, and interrupted circulation through the lungs and heart, at the commencement of the paroxysm. In these, a very opposite treatment to depletion is required. The observations of LATHAM, HALL, GOOCH, NORTH, and the author, on this important practical topic, have, however, induced the practitioners of the present day to resort to blood-letting in convulsions in a much more discriminating manner than formerly.

50. *d.* Next in importance is the judicious employment of *cold* and *heat* — of cold in the form of cold affusion on the head and spine, and of heat in that of warm bath or semicupium. An appropriate use of these is more generally serviceable, and often less dangerous, than depletions. The *cold affusion* to the head, and, in cases where there seems to be irritation of the spinal envelopes, along the vertebræ; and cold, in the form of epithems, evaporating lotions, pounded ice to the head, when convulsions are produced by inflammatory action in the brain or spinal chord; are among the chief forms in which this agent is admissible. The *cold bath*, although advised by CURRIE, LOEFFLER, BEAUMES, BAYNARD, and others, is, in my opinion, a hazardous experiment during the paroxysm, and sometimes even in the interval. The *warm* bath, or *semicupium*, is frequently of much service, and particularly when there is either high nervous irritation, a dry harsh skin, or cold surface or extremities; and my experience accords with that of HEILBRONN, HENRISCHEN, DOERNER, and STUTZ, respecting the propriety of adding a quantity of the fixed alkalies, or their sub-carbonates, to the water. When the head is much affected, either by inflammatory irritation of the membranes or active congestion, cold affusion, or cold epithems or lotions, may be employed whilst the patient is in the warm bath, or is using the semicupium or pediluvium. In slight cases of convulsion, the aspersion merely of cold water over the face, head, or neck, is often of service. Large draughts of cold water were recommended by HOFFMANN; and they, as well as water ices, and cold clysters, have been several times employed by myself with much benefit. Cold injections are praised by LANGHANS and MARX. Cold affusion, cold aspersion, and cold epithems, have been prescribed by CURRIE, DUPONT, DOEMLING, and others; but the two former were usually directed by them to the surface generally, instead of to the head, — a circumstance which accounts for the disuse into which it had fallen, when the practice was revived some years since by the author.

51. *e.* If the patient can swallow, and the muscles of the jaw are not much affected, *cathartic* medicines should be given by the mouth; but in most instances it will be preferable to delay them until after the seizure. But I have under no circumstances been prevented from directing a cathartic and *antispasmodic* enema to be thrown up. Either of F. 131—136. may be employed and repeated, if it be not retained, as is frequently the case. When purgatives can be taken, a full dose of *calomel*, either alone or with jalap, followed soon afterwards by an active cathartic draught or mixture, consisting of senna, tincture of jalap, carminatives, and antispasmodics, particularly the preparations of ammonia and camphor, is, upon the whole, the most appropriate. But under every circumstance the operation of these should be promoted by enemata. When we wish to produce an active derivation from the head and spine, as well as alvine evacuations, the croton oil, elaterium, ol. terebinthinæ, &c., may be employed. But, where the object is chiefly to bring away offending secretions, and other causes of irritation, and at the same time to allay disordered action in the *prima via*, calomel, jalap, rhubarb, and senna, are, perhaps, the best purgatives we can employ. Their action will, in all instances, be much increased, and a marked change be often produced in the disease, by an occasional dose of the ol. terebinth. and ol. ricini, assisted by the enemata already recommended. If convulsions arise from *worms* in the intestines, *anthelmintic* purgatives, during both the paroxysms and interval, should not be omitted. Calomel may generally, with due address, be exhibited during the fit, and subsequently other anthelmintics may be given. BERGIUS and BARTON prefer the *Spigelia Marylandica* in such cases; but the other means adopted in verminous disorders may be employed according to circumstances. *Emetics* are sometimes of service, when exhibited upon the first intimation of the seizure, particularly if there be indications of gastric irritation from offending or noxious ingesta, and acid sordes, or if the paroxysms assume a periodic form. SCHENCK, SCHÆFFER, RIGEL, CONRADI, HUFELAND, and SMITH, advise them chiefly in such cases. THOM recommends them to be exhibited to the nurse, when convulsions attack infants.

52. *f. Antispasmodics* are sometimes productive of instant relief, when employed in large doses, early in or upon the first intimation of the fit, particularly when it arises from debility, or irritation in the prima via, or morbid nervous susceptibility; but they seldom can be taken in the paroxysm, unless it be slight, or arise from exhausting causes, and then they are often of great service, especially if they be combined with restoratives and opium, conium, or hyoscyamus. The æthers, camphor, musk, assafœtida, valerian, the preparations of ammonia, bismuth, zinc, &c., are amongst the most efficacious in these cases. When inflammatory irritation seems to exist in the membranes of the brain, they are obviously contra-indicated; but congestion of a passive nature, especially when the pulsations of the carotids are not strong or hard, and the temperature of the head is not increased, should be no reason for omitting them. An extensive experience, however, of the effects of the spirit of turpentine in convulsive diseases, has convinced me that it is the most efficacious

and the safest antispasmodic that can be employed for their removal. If it be given in doses so large as to act as a purgative, and seldom or rarely repeated, it is remarkably beneficial in the cases which arise from cerebral congestion or irritation; but when the seizure is connected with anæmia, or exhausted vital power of the brain, or general debility, it ought to be exhibited in small doses, often repeated, and be combined with restoratives and aromatics. Michaëlis, Schmalz, Albers, Hargens, Conradi, Heilbronn, and Wiedemann, strenuously advise, in all convulsive affections, large doses of the *fixed alkalies*, either alone or alternated with *opium*. Of the antispasmodic action of these substances, as well as of their soothing operation on the digestive mucous surface, there can be no doubt. If the convulsions arise not primarily from organic disease within the head, I believe that opium thus combined will often be of great service, and particularly when they proceed from the nervous susceptibility and muscular irritability often connected with debility, exhaustion, and excessive evacuations. The good effects of alkalies in disorders of the digestive functions, and the frequent origin of convulsions in these disorders, or their connection with them, must be admitted. Moreover, the alkalies, combined with opium, or hyoscyamus, conium, or belladonna, and ipecacuanha, &c., are among the surest means we possess of allaying irritations affecting the nervous system. Stutz, Bruninghausen, Doerner, and Henrischen, employ them also in fomentations to the abdomen, in baths, and in enemata; they using an ounce of the caustic alkali to about a quart of water for the fomentation. I have prescribed the alkalies frequently and largely in the convulsions of children with much benefit. Other antispasmodics, and different modes of applying those in common use, have been adopted by various writers; but as these are better suited to fulfil the second intention of cure, I will notice them hereafter.

53. *g. Anodynes* and *narcotics* are often of the most essential benefit, when appropriately prescribed and combined, or preceded by other suitable remedies. They are seldom of service in the convulsions proceeding from active congestion and organic disease within the head; but when the affection is connected with irritation in other parts, or when the disorder of the brain or its membranes consists chiefly of irritation, they should not be omitted. They are seldom of use, — sometimes even injurious, in puerperal convulsions, and ought to be given with caution to very young children. In cases where the propriety of exhibiting them is doubtful, any unpleasant operation will be prevented by combining them with camphor, or with aromatic tinctures or spirits. I have derived great advantage from employing them *externally*, selecting for this purpose *opium* or *belladonna*, in the form of embrocation or plaster — generally the former — applied during the paroxysm, over the epigastrium and abdomen, and combining them with rubefacient and stimulating substances, as camphor, ammonia, Cayenne pepper, &c., or with any of the liniments or plasters in the Pharmacopœias, or in the *Appendix*, suited to the case (F. 108. 297. 307.). The practitioner should, however, be cautious in the employment of the more active of these narcotics, even externally, as very dangerous effects have resulted from them. Dr. Thackeray found that *tobacco* steeped in brandy, and placed over the epigastrium, produced a most dangerous state of vital depression.

54. *h. Revulsants* and *counter-irritants* are of great service in all states of the disease accompanied with cerebral congestion, or irritation of the membranes of the brain or spinal chord. Sinapisms to the extremities; rubefacient liniments (F. 299. 305.), and embrocations, particularly those with Cayenne pepper, horseradish, &c.; the turpentine fomentation; the immersion of the hands and feet, or the lower extremities, in a salt and mustard bath; *dry cupping* on the nape of the neck, occiput, between the shoulders, or along the spine; are the preferable means of this description. These will often, of themselves, shorten the seizure; but if they fail of having this effect, after slight redness of the skin has been produced, advantage will frequently arise from placing over it a liniment or embrocation containing opium, or the acetate or muriate of morphine, or any of the other anodynes in use, either of which may also be employed in the form of plaster, combined with antispasmodics, &c.

55. *i.* Convulsions arising from *exhaustion*, *hæmorrhagy*, *inanition*, &c. require restoratives, stimulants, &c. in small quantity, and frequently exhibited, with strict attention to the temperature of the head, which should be lowered whenever it rises above natural, by cold applications. (See Abstinence—*Treatment of*; and Blood—*Deficiency of*, § 48, 49.) The combination of hyoscyamus with gentle tonics; the preparations of opium, conium, or hop, with those of ammonia and camphor; the preparations of valerian or assafœtida with the sub-carbonates of the alkalies; the muriate or acetate of morphine, with the aromatic spirits and tonic tinctures; and emollient and antispasmodic enemata, are most appropriate to those cases. In these, as well as in the more clonic forms of convulsions, the preparations of *iron*, particularly the *ammonia-tartrite of iron**, alone or combined with hyoscyamus, will be of much service. The occurrence of these affections towards the close of *febrile* or *acute diseases* (§ 13. 33.), particularly when they manifest signs of greatly *depressed vital power*, requires nearly similar remedies, or such as exert a still more stimulant and antispasmodic operation. The sulphate of quinine, with hyoscyamus and camphor; the decoction of cinchona, or infusion of arnica or serpentaria, with liquor ammoniæ acetatis and æther; warm negus, with aromatics; and stimulating embrocations or liniments over the epigastrium, may be resorted to in these cases. If convulsions occur in *the course*, or towards *the crisis of fevers*, the treatment must altogether depend upon the state of the cerebral functions, and the disposition that may be evinced towards spontaneous or critical evacuations, to the promotion of which our means should be directed; taking care, at the same time, to guard the head from mischief, by employing local depletions, cold affusion, cold

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* A most valuable and beautiful preparation very lately introduced by Mr. Aiken; and from its very pleasant, sweet taste — resembling that of liquorice — extremely well adapted for children. Dose from half a grain to five or six grains.

epithems, and internal and external revulsants, if it exhibit appearances of congestion or inflammatory irritation; and warm diaphoretics, gentle tonics, and antispasmodics, and other means of supporting the manifestations of vital power in the nervous systems, and of promoting the secreting and excreting functions.

56. *k.* When convulsions are produced by *narcotic* or *acro-narcotic poisons*, the immediate evacuation of the noxious substance by the stomach pump, or by emetics, the cold affusion on the head, followed by stimulants and antispasmodics, green tea, or coffee, stimulating enemata, and frictions of the surface, are chiefly to be depended upon. If they proceed from the *fumes of lead* or *mercury*, antispasmodics, tonics, stimulants, strychnine, or nux vomica, with purgatives, are most serviceable, particularly when assisted by the warm bath, and by frictions of the surface afterwards with stimulating liniments. Serpentaria, the arnica montana, and camphor, are often beneficial remedies in those cases.

57. *l.* Convulsions either of a partial, a general, or irregular and anomalous form, arising from *irritation of the female organs*, require local depletions, cooling aperients, and antispasmodics; the internal use of soda and nitre; cold clysters; the cold affusion or aspersion; the tepid bath, or the shower bath, while standing in warm water; and draughts of cold water. In a case of general convulsions arising from inflammatory irritation about the neck of the uterus, with leucorrhœa, I directed the patient to take a lemon ice, or to drink as much as she could of cold spring water upon the intimation of the seizure; and she has hitherto done so with uniform benefit. Having seen her during the paroxysm, and perceiving that she retained her consciousness, cold water was given, and swallowed with some difficulty. The benefit was almost instantaneous. If the convulsions be connected with difficult, or suppressed menstruation, general or local depletions, and afterwards the warm general or hip bath, full doses of the preparations of assafœtida and ammonia, particularly the spir. ammon. succin., the spir. ammon. fœtid., or the spirit. guaiaci ammon., also camphor and the boracic acid, or the sub-borate of soda, have proved the most effectual remedies in my practice. But the means already advised to prevent congestion or irritation within the cranium should be resorted to upon the first intimation of the fit. Bleeding by leeches from the inside tops of the thighs are indicated in these cases; but it can be practised only in the interval.

58. *B. The prevention of the paroxysms* is to be attempted, with due attention to the remote and proximate causes, the former of which should be removed as completely as possible, and the latter energetically but cautiously combated; recollecting always that convulsions are the outward manifestations of certain lesions of the nervous, acting on the muscular, functions; and that our knowledge of such lesions extends not beyond the inference that they consist of depression or exhaustion of vital power, or of irritation, or of congestion, and, occasionally, of two or all these states conjoined, some one of them predominating over the others, and being associated with additional, and even opposite changes. Many of the means already noticed are requisite in the intervals, as well as in the paroxysm, especially when judiciously modified to the circumstances of the case. *a. Vascular depletion* is often required, and in similar states of disease to those already pointed out; but it should be directed with great circumspection, and to a moderate extent, unless the signs of active cerebral congestion, or of inflammatory irritation, or of general plethora, be unequivocal. If, however, opposite states obtain, viz. exhaustion, and deficiency of blood, very different means must be employed. In most instances of convulsions, the quantity of the circulating fluid is not so frequently either much above or much below the usual proportion, as the influence, — vital or nervous, or by whatever name it may be called, — by which the distribution of blood throughout the frame is regulated, is disturbed so as to determine or attract a larger proportion to one part than to another. In no peculiarity of constitution is the old doctrine, "*ubi irritatio, ibi fluxus,*" more frequently illustrated than in that in which convulsive complaints are most commonly observed; and, in these diseases, we are continually finding fluxion one of the earliest consequences of irritation. I have long thought, and on several occasions contended, that, in the common routine of practice, blood-letting is too indiscriminately employed to remove such determinations or irregular distribution of the circulating mass; and that, although it sometimes succeeds, owing to its being associated with other and more appropriate means; it often fails, or even augments the mischief, by increasing the debility and susceptibility of impressions from exciting or irritating causes, that generally characterises the nervous system of persons subject to convulsive seizures. Therefore, when the abstraction of blood is really necessary, it should be performed in such a manner, and be accompanied with, or followed by, such medicines as are most likely to equalise the circulation; and it is chiefly in this way that many of those about to be noticed are productive of any service in the disease. Local depletions, in moderate quantity, repeated according to circumstances, — from the nape of the neck or occiput, when the head is affected, and along the spine, if irritation of the membranes of the chord is suspected,—and assisted by such other means as the case may require, are more generally applicable in the intervals than large venæsections.

59. *b.* There are few remedies more beneficial in convulsions than *mild purgatives*, or aperients, taken daily, and conjoined with tonics and antispasmodics. Active purgation, if long persisted in, will lower the vital energy, and thereby favour the return of the fits; but the more deobstruent and eccoprotic medicines of this class, particularly when thus combined, may be given, so as to procure two or three fæculent evacuations daily. Thus prescribed, purgatives will increase the patient's strength, and often procure a prolonged immunity from the seizures. *Aloes*, with quinine or iron, and camphor; or with myrrh, assafœtida, the tonic extracts, &c., and occasionally with blue pill, or with extract of hop, hyoscyamus, or conium (F. 450—471.); *senna*, with gentian or bark, the preparations of ammonia, æther, &c. (F. 266. 872.); and either

of these with the liquor potassæ, or the alkaline sub-carbonates, are most to be relied on. But advantage will accrue from changing the forms and mode of combination and exhibition of purgatives from time to time, and from assisting them with such other remedies as the special characters of the case may require. A full dose of calomel, followed by the turpentine draught (§ 51.), may occasionally be resorted to; and enemata will also be of service. In every instance, the appearance and quantity of the discharges, intestinal and urinary, should be examined; and when the sensibility of the bowels seems to be increased, oleaginous or mild purgatives, with alkalies and hyoscyamus, ought to be preferred. Morgagni recommended, as an aperient, two ounces of the ol. amygdal. dulc. to be taken every night, — a medicine well suited to cases of this description; but the ol. olivæ, ol. lini, or the ol. ricini, and even the cod or tusk-liver oil, may also be thus used. Where we find the tongue much loaded or furred, active purgatives, particularly full doses of calomel, with cathartic extracts, &c., are especially required in the first instance; and mild laxatives, with tonics and antispasmodics, subsequently.

60. *c.* In many cases, particularly when the convulsions proceed from inflammatory irritation of the membranes of the brain or spinal chord, *bleeding* and *purgatives* will be advantageously followed by an *alterative course of mercury*, pushed as far as to affect the gums, and by low diet. Much tact is, however, required in determining as to the cases and period of treatment, in which this practice should be adopted. It is admissible only when the disease proceeds from the pathological state just mentioned, or is connected with a syphilitic taint, or has originated in the abuse of spirituous liquors, &c., and the too great indulgence of the appetite for food; and it will be injurious in cases of exhaustion, unless combined with active tonics and nutritious diet. Plummer's pill, the hydrarg. cum creta, or the blue pill, may be given, in small and frequently repeated doses (from half a grain to a grain of the last, thrice a day), with anodynes, as conium, hyoscyamus, ext. humuli, and small quantities of camphor. In more doubtful cases, or when we suspect that effusion of fluid has supervened upon disease of the membranes, the corrosive sublimate may be prescribed, either in the compound tincture of cinchona, or with the compound decoction of sarsaparilla, or diuretic infusions or spirits, according to the symptoms and circumstances of the case.

61. *d.* Various *antispasmodics* and *tonics*, besides those already adduced, have been directed, chiefly in the intervals; and others in more common use have been employed in novel forms. The *cuprum ammoniatum* has been prescribed by Home, Duncan, and Bianchi; the *nitrate of silver*, by Powell and Hall; the *animal oil of dippel*, by Herz; the oil of *rue*, by Abrahamson; *cajeput oil*, by Thunberg; the *misletoe*, by Colbatch and Home; and the preparations of *zinc*, by Goodsir, Bell, Beaumes, Duguid, White, and many more. Krebs has advised the trunk of the body to be enveloped in *camphorated cloths*, if we suspect convulsions to arise from intestinal worms. Warburg has recommended *musk* in large doses, combined with *nitre*; and Sidren and Frankfurter the internal use of *nux vomica*, apparently upon the principle of Hahnemann, that *similes similibus curantur*. Cazals directed about half a drachm of *bismuth* to be taken in the twenty-four hours, with *castor*. Vogel thought that benefit has been derived from the flowers of the *white lily*; and Baker, Pallas, Thom, and Home, entertained a similar opinion as to the effect of the *cardamine* and *anemone pratensis, artemisia*, and the *radix pæoniæ*. *Digitalis* was employed by Shaal; *emollients*, by Kortum; *ipecacuanha*, by Plenk; and various *narcotics* by the majority of authors, chiefly in combination with stimulating antispasmodics, in order to ensure their effect. Of the substances now enumerated, the most deserving of notice seem to be the preparations of zinc, bismuth, musk, and the misletoe. Of the former of these I have had much experience; but, upon the whole, they are inferior to *camphor, valerian, assafœtida, ammonia*, and the *æthers*, judiciously combined and assisted by other remedies, particularly when taken upon the first intimation of the seizure. If the disease be the result of exhaustion or inanition, and particularly if it assume a periodic form, the preparations of *cinchona*, the sulphate of quinine, *iron* (Buechner, Reidlin, Loeffler, Hutchinson, Elliotson, &c.), especially the sub-carbonate in large doses, or the ammonia-tartrite, and the *arsenical* solution with *potash*, are the most appropriate remedies, either alone, or with aperients, or antispasmodics, or anodynes and narcotics, according to the peculiarities of the case. I have, for many years, employed the *infusion of green tea*, if the convulsions arise not from inflammatory action within the head, and generally with great success. The good effects of the medicines now mentioned, when they produce any, are to be imputed chiefly to their influence in overcoming the susceptibility of the nervous system, giving tone and energy to the moving fibres, and increasing the secreting and excreting functions. In order to ensure their effects, they should be varied and changed from time to time, and differently combined with one another.

62. *e.* There is scarcely any *anodyne* or *narcotic substance*, that has not been employed in convulsions. The preparations of *opium*, of *poppy*, of *belladonna* (Stoll, Bergius, &c.), of *conium* (Stoerck, &c.), of *hyoscyamus, stramonium* (Stoerck, Sidren, Wadenberg, &c.), and *tobacco* (Riverius, Currie, Thackeray, Haygarth, &c.), have been prescribed in various modes and states of combination — with aperients, or stimulants, or tonics, &c. — internally and externally — in enemata, and in suppositories. The most successful modes of exhibiting either of these substances, in convulsions, are *internally* with camphor, assafœtida, or the sub-carbonates of the alkalies; and *externally*, either in the form of liniment, embrocation, or plaster on the epigastrium, or along the spine, combined with the substances just mentioned, or with any of the liniments or plasters in the Pharmacopœias, or in the Appendix.

63. *f.* Various *derivatives* or *revulsants* have been used in the intervals, as well as in the paroxysm. Blisters may be employed; but they are not so generally appropriate as the production of a number of pustules by means of the tartar emetic ointment or solution (F. 749.), or of the croton oil, rubbed

upon the inside of the thighs, or on the epigastrium, or along the spine. Several writers have directed blisters to the head; but the pathological states admitting of their application in this situation are comparatively rare, and require the most intimate knowledge of disease, and appreciation of symptoms for their recognition. It is only when the vital energy of the brain is profoundly sunk or exhausted, and not suppressed by congestion, or active determination of blood, or the pressure of effused fluids, or adventitious formations, that a blister on the scalp can be of any service. When applied to the nape of the neck, or behind the ears, or between the shoulders, they are seldom of much use, unless kept open for some time. The pea or mezereon issue in the insides of the thighs, and antispasmodic liniments or plasters along the spine, or over the epigastrium, are sometimes useful auxiliaries.

64. *g. Electricity* and *galvanism* have been proposed in convulsions; but I agree with **Grapengiesser** in thinking them hazardous. *h. Cold bathing* has been very commonly recommended; but it requires discrimination. It will benefit chiefly those cases which are unconnected with organic lesion, and which depend upon general debility and susceptibility of the nervous system. In these the salt water bath should be preferred, and its use commenced in the tepid state, the temperature of successive baths being gradually reduced. The *cold shower bath* is more generally applicable, particularly upon getting out of bed; and when it cannot be resorted to, the patient ought to sponge or bathe the whole head with cold water every morning. The strictest attention should, at the same time, be paid to the state of the digestive functions, and of the alvine evacuations. Cutaneous excretion also ought to be promoted; for, not only are all the other functions thereby improved, but contingent disturbance of any of them, and the irregular distribution of blood, in which convulsions often originate, are less likely to take place whilst the circulation in the surfaces is uninterrupted. It is probably from this mode of operation, as much as from their antispasmodic action, that service has been obtained from several diaphoretics, particularly the *kermes mineral*, and other antimonials, recommended by **Unzer**, **Gulbrand**, **Struve**, and **Harder**. *i. Warm baths, hip baths, semicupium*, &c., when any advantage is derived from them in the intervals, act chiefly in this manner. But I believe that they will seldom be productive of much benefit, unless in cases connected with suppressed eruptions, or the exanthemata, or with irregular or difficult menstruation, and with disorders of the digestive canal in children; and in these the effects of warm baths will be much enhanced by stimulating or irritating frictions of the surface immediately upon coming out of them.

65. *k.* The almost epidemic prevalence of convulsions during states of religious enthusiasm and mental excitement, as shown by the occurrences already referred to (§ 16—18.), and by the seizures that affected many of the Jansenists who made pilgrimages to the grave of Deacon Paris, during the persecution of this sect in 1724, as well as by the convulsions at one time so uncommonly frequent in the Methodist meetings in various parts of Cornwall, as described by Mr. **Cornish**, should lead the physician to recommend such moral regimen as the circumstances of particular cases may seem to require. The above facts, as well as the circumstance recorded by **Boerhaave**, of almost all the girls and boys in the hospital of Haerlem being seized by convulsions from their seeing a girl who had been frightened into them, will alone show the importance of separating the affected from females or other susceptible persons. There can be no doubt that simple hysterical or epileptic convulsions occurring in one among a crowd of females will often occasion convulsive seizures in others, particularly in those of a delicate frame and nervous temperament, although they may have never previously been similarly disordered. I have met with such an occurrence more than once. Indeed, the number of these attacks on the public occasions referred to, is a sufficient proof both of the influence of the mind in producing them, and of the propriety of the immediate separation of a person thus seized, as was judiciously and successfully practised by Dr. **Haygarth**. The propensity to become affected by convulsions from seeing one in a fit appears to have been well known to the Romans, and from its frequency on occasions of public assembly, as much as from other considerations, they obtained the name of *Morbus Comitialis*, which has been understood as applying only to epilepsy, but which I believe had a much wider signification, and comprised all convulsive seizures. That fear or terror will not only occasion convulsions, but also remove them, or at least often prevent their accession, might be inferred *à priori*, even if it were not proved by experience. The actual cautery employed by **Boerhaave** soon put a stop to them in the hospital at Haerlem: and their prevalence in certain of the Zetland Isles was said to have been arrested by the unceremonious ducking inflicted upon two or three of those affected; the fear of being treated in the same way having effectually prevented others from being attacked.

66. *l. Regimen.*—The circumstance of those convulsions which arise in crowded assemblies from mental excitement and religious impressions being often ushered in by faintings, and signs of congestion of the cavities of the heart, of the large vessels, of the lungs, &c., should suggest the avoidance, by susceptible persons, of warm and crowded assemblies, where the foul and moist air conspires with moral emotions in depressing the nervous power, and in favouring congestions of the heart's cavities and large vessels; as well as the propriety of removal to the open air, and of having recourse to antispasmodic stimulants upon the approach of the sinking and oppression at the epigastrium and præcordia, which often usher in the fit. The importance of administering to the mental affections and emotions — of relieving as much as possible anxiety or despondency — ought to be pointed out to those concerned, and the patient encouraged strenuously to resist the invasion of the paroxysm. Persons subject to convulsions should never receive indulgence on account of *them*, but be made to know that they may be warded off, by not yielding to the feelings which often favour or produce them. Regular hours of rest, of recreation, and of eating, should be adopted; seden-

tary habits avoided; exercise in the open air taken daily, and both the mind and body duly occupied without fatiguing either the one or the other. In some cases, depending upon disease of the brain or its membranes, the appetite is morbidly increased, and much more food is taken than is requisite to the wants of the frame. Others are connected with indulgence in spirituous liquors. It is almost unnecessary to add, that unless these excesses be guarded against, and the diet and regimen duly regulated, medical treatment will not be efficacious.

67. ii. Treatment of Convulsions in Infants and Children. — *A.* Many of the measures already recommended *in the paroxysm* may be also employed in this class of patients; but in a suitable form, and with strict reference to existing pathological states. Where we observe the indications of cerebral irritation and congestion (§ 21, 24.), *cupping* on the nape of the neck, behind the ears or occiput; the *warm bath* or semicupium, with *cold affusion;* cold epithems, &c., on the head, the hair having been removed or cut close; a dose of *calomel*, or of calomel and scammony if the child can swallow, and a *cathartic and antispasmodic injection;* are suitable remedies. The jugular vein may be opened in robust or well-grown children; but care should be taken not to bleed them to syncope, as a return of the convulsions may be thereby occasioned. Children ought to be blooded with great caution during a fit; for although I cannot go so far as to say, with Harris, that it is dangerous to bleed in the paroxysm, yet I believe that the convulsions will occasion a hurtful quantity of blood to flow without any immediate effect, if the evacuation be pushed with the view either of subduing them, or inducing syncope. It is as improper as it is futile to lay down any rules as to the extent to which depletion may be carried. It is obvious, that when the child is plethoric, the head large and hot, the eyes suffused and prominent, the carotids throbbing, &c., it may be practised freely, even in the fit, without risk.

68. *a.* Convulsions sometimes proceed from the nature of the ingesta. If this be the case, and if the abdomen be distended, an *emetic* should be exhibited without delay. Seizures not infrequently arise during the period of dentition, from indigestible or irritating substances in the *primæ via*, and in such cases often commence in simple flatulent colic. After an *emetic* has been exhibited, or even independently of it, a *purgative*, if it can be taken, should be prescribed, along with carminatives or antispasmodics, and a clyster thrown up. In cases of this description, I have found a dose of calomel, with soda or potash, or the hydrarg. cum creta, followed by either of the following mixtures, a carminative enema, and friction with an antispasmodic liniment on the abdomen or spine, the most successful means: —

No. 158. ℞ Magnes. Ustæ ʒ ss.; Sacchari Albi ℈ j.; Olei Anisi ♏ v.; tere bene simul, et adde Aquæ Fœniculi Dul. ℥ jss.; Spirit. Ammon. Fœtid. ♏ xv.; Pulv. Rhei xvj.; Syrup. Papaveris ℥ ij. Fiat Mist., cujus capiat coch. unum, vel duo minima, tertiis vel quartis horis.

No. 159. ℞ Olei Ricini ʒ iij.—℥ ss.; Olei Terebinth. ʒ j.—ʒ ij.; tere cum Vitel. Ovi, et adde Aq. Fœniculi ℥ ss.—℥ j.; Syrup. Papaveris et Syrup. Rosæ āā ʒ ij. M. Fiat Mist., cujus sumat partem quartam vel tertiam, tertiis vel quartis horis.

69. *b. Clysters*, containing valerian, assafœtida, or a terebinthinate substance, triturated with the yolk of egg, and any of the carminative waters, to which oleum ricini or ol. olivæ may be sometimes added, are the most appropriate to those cases. Much discrimination is required as to the choice and continuance of cold applications to the head, particularly if the warm bath or semicupium be simultaneously resorted to. These combined means should never be left to the discretion of a nurse, at least without the personal superintendence of the practitioner in the first instance. In general, as soon as the temperature is reduced, and the features become pale and shrunk, or the fontanelle (if unclosed) level, or at all depressed, whether the convulsions, or sopor, when present, disappear or not, the application of cold to the head, in any form, should be left off, to be again resumed when the symptoms requiring it recur.

70. *c.* During dentition, or even before the teeth approach the margin of the gums, free *scarifications* ought to be practised, and repeated as soon as the scarified parts cicatrise, otherwise the obstacle to the passage of the teeth will be thereby increased. If general or cerebral plethora be not present, or has been removed, and the bowels have been fully evacuated, any of the alkaline or earthy sub-carbonates, with aqua fœniculi, or aq. pimentæ, æther, camphor, &c., with the extract of conium or hyoscyamus, or the syrup of poppies, or small doses of laudanum, may be prescribed with the view of soothing the susceptibility and irritability of the frame at this period. Form. 347. 442. 865. have been ordered by me very generally in such cases, at the Infirmary for Children. In very young infants, convulsions may be occasioned solely by the retention and accumulation of acid and acrid sordes in the *primæ via*. These are readily removed by a dose of calomel, followed by oleaginous or other purgatives, the semicupium, and clysters. Tissot and Sharp state that they have been produced by the retention of the meconium owing to spasmodic stricture of the sphincter ani. This is, however, a rare occurrence. Emollients, oleaginous laxatives, the semicupium, clysters, and anodyne liniments, are appropriate to such cases. It has been repeatedly contended for by most of the older, although denied by many modern writers, that the anxieties, the more violent passions, and the irregularities of the nurse, may change her milk so as to disorder the digestive organs, and thereby give rise to convulsions in delicate infants. This fact is established by repeated observation. I perfectly agree with Mr. North, who has taken a very judicious view of this subject, that it should never be overlooked. The obvious remedy in such cases is to change the nurse; and, if this cannot be done, to remove as far as may be the cause of disorder; to promote her digestive and excreting functions; to tranquillise or subdue any mental disturbance or febrile action that may affect the state of the milk, and to prescribe for the infant aperients with soda or ammonia, or other antacids and antispasmodics. I have often employed the oxyde of zinc or of bismuth with soda, or the pulvis cretæ compos., and either the pulvis ipecacuanhæ comp., or small doses of conium or hyoscyamus, with much advantage in these cases; or simply the sub-borate of soda in camphor mixture or aq. fœniculi.

71. *d.* The *cold bath* is a very doubtful remedy in the seizure: it is much less efficacious than the cold affusion on the head; and, when the child retains its consciousness, it even sometimes aggravates the mischief. Of the recommendation of Dr. Bronn, to employ gradually increased *pressure* on the epigastrium during the fit, I have had no experience: it, however, deserves a trial.

72. *e.* Of the use of *blisters* in convulsions, as well as of alkaline rubefacients, as the liquor amamonæ, no favourable idea should be entertained, as they require the utmost discrimination, and are far from being unattended by risk: for, although they will often cut short the paroxysm, yet they will also occasionally produce so violent irritation and inflammation as to be rapidly followed by sphacelation of the integuments. This is liable to happen particularly in ill or insufficiently fed, in delicate and irritable children; in those of a gross or fat habit of body, who have been allowed to feed upon the richer sorts of animal food too exclusively; in the state of vital exhaustion observed in the latter stages of disease, as well as in the early periods, when the pulse is very quick, irritable, or sharp, the skin dry and burning, and the cerebral organs much excited or oppressed; — under such circumstances, I have usually directed a liniment composed of equal quantities of the liniment. saponis et opii (*Ed. Phar.*), and of the liniment. terebinthinæ, or either of F. 308. 311. to be rubbed on the epigastrium and abdomen, or along the spine. Thunberg advises the cajeput oil to be applied to the epigastric region during the fit; Herz directs the animal oil of dippel to the same region, and Abrahamson the oil of rue. Either of these will frequently cut short the paroxysm, but I can assert, from a very extensive experience, that the liniments I have recommended are the safest and most efficacious.

73. *f.* When convulsions occur in the invasion of any of the *exanthematous fevers*, or upon the retrocession of the eruption, the treatment must depend, in a great measure, on the habit and strength of body, and the extent to which the brain is affected. If cerebral congestion or irritation, with general heat of surface, exist, local depletions, the cold affusion on the head, whilst the patient is plunged in a warm bath, to which some vegetable or mineral alkali has been added, cooling aperients, cathartic injections, the tartar-emetic ointment and solution F. 749. rubbed on the spine, and diaphoretics, are generally most serviceable. After the bowels have been freely evacuated, the carbonate of soda and nitrate of potash, given in mucilaginous vehicles; the spirit. ætheris nitrici, with the liquor ammoniæ acetatis, in camphor, jalap, &c.; may be prescribed. If the skin be cool, and the pulse weak, or if the fit have occurred after the disappearance of the eruption, salt and mustard may be put in the bath; and if the countenance be pale and collapsed, and the cerebral functions not materially disturbed, warm and cordial diaphoretics, as the preparations of ammonia, camphor, serpentaria, &c., exhibited from time to time. Frictions of the surface, immediately after the patient is taken out of the bath, will generally promote its good effects.

74. *g.* If convulsions occur in the course of *hooping cough or croup*, we may conclude that congestion, or inflammatory irritation of the membranes of the brain, has supervened, and should direct local depletions, the cold affusion on the head, semicupium, and the sub-carbonates of the fixed alkalies, with opium, hyoscyamus, or belladonna, in minute doses, unless the patient is already much reduced by repeated or large evacuations, when we may infer that the convulsive seizures are connected with anæmia, and should prescribe the treatment already described in relation to this state (§ 55.).

75. *h.* The convulsions which occur so frequently as a consequence of chronic or *severe bowel complaints*, and of exhaustion from other diseases, and which have been too frequently imputed to dropsical effusion in the ventricles, require cordial antispasmodics, tonics, and light nutritious diet. Although sometimes attended by more or less effusion, arising from the physical condition of the cranium and its contents, and serving to prevent any vacuum from being occasioned by the deficiency of blood in the cerebral vessels, yet the convulsions should not be viewed as proceeding from the effused fluid, but rather from the irregular and imperfect supply of blood to the cerebral structure.

76. *i.* The seizures that follow great *losses of blood* in children are generally characterised by too active determination of this fluid to the cerebral structure; and require the head to be kept cool and elevated, the bowels to be acted upon, and restoratives, antispasmodics, cordials, and tonics to be administered, with the extract of poppies, conium, or hyoscyamus, according to the peculiarities of the case.

77. *k.* If convulsions follow the disappearance or *repulsion* of *chronic eruptions*, we should dread the existence of inflammatory irritation of the membranes of the brain or medulla oblongata or spinalis, with a tendency to serous effusion. Local depletions, the warm bath; frictions of the surface, particularly of the part whence the eruption had disappeared, with irritating liniments; the use of sinapisms, and deobstruent purgatives, as calomel, &c.; are chiefly to be confided in.

78. *l.* When the seizures have recurred several times, particularly in infants, and are attended by dilated pupil, squinting, slow pulse, &c., their connection with *hydrocephalus* may be inferred. In such cases, even local depletions should be employed with caution: but in many instances they may still be resorted to, in small quantity; and followed by alterative doses of calomel or hyd. cum creta, diuretics, small doses of digitalis with spirit. æther. nit., and the use of the liniment (F. 311.) to the head and loins both in the fit and in the interval.

79. *B.* The *preventive treatment*, *a*, in *plethoric*, fat, and gross-living children, should chiefly consist of a proper regulation of diet, as advised by Beaumes. Farinaceous food ought to be adopted, with only an occasional indulgence of the less stimulating meats. No rational plan of treatment, however, can be attempted with the view of prevention, without strict reference to the remote and proximate causes of the affection; the former of which should be carefully avoided, and the latter removed by suitable treatment. When we detect cerebral irritation, or determination of blood to the brain, or active congestion,

cupping, as already directed; the daily affusion of cold water on, and a constantly cool state of, the head; a moderate, but continued, action on all the secreting and excreting organs; tranquillity, and the abstraction of all excitement of the mind and senses; a bland and low diet; the use of revulsants, and warm clothing on the lower extremities; are the most appropriate remedies.

80. *b.* In very *delicate children*, where no evident inflammatory irritation within the head exists, a tonic treatment is obviously requisite. The sub-carbonate or ammonia-tartrite of iron may be given, either alone, or with other antispasmodics, or any of the other preparations of this metal. The sulphate of quinine, or the preparations of cinchona, with liq. ammoniæ acetatis, and a little of any of the compound spirits of ammonia; suitable diet, attention to the state of the bowels, and change of air, will also be of service. Calomel, in frequently repeated doses, either alone, or with purgatives or anodynes, has been most injuriously resorted to by practitioners, upon the mistaken notion that convulsions are always connected with irritation within the cranium, and that this medicine alone can remove this state; whereas, if calomel be prescribed in small and frequently repeated doses, it will actually increase the susceptibility and irritability of the body generally. When, however, it is given in full doses at distant intervals, or only occasionally, and either combined with jalap or some more active purgative, or followed by cathartics and enemata, it is a valuable remedy. Where the bowels are thus judiciously acted upon from time to time, and particularly if this be accomplished by a terebinthinated draught, tonics, combined with antispasmodics and anodynes, will be of the greatest benefit, especially if there be no disorder of the cerebral functions to forbid their exhibition. The sulphate or oxide of zinc, or the sulphate of quinine, or the oil or other preparations of valerian, or assafœtida, musk, &c., with either conium, hyoscyamus, or the extract of poppy; the tonic decoctions and infusions, with the alkalies; and various other remedies already recommended in the intervals (§ 61. 75.), may be severally employed, according to circumstances, after purgatives have been duly prescribed, and the stools have become natural.

81. *c.* When we have reason to infer that the convulsions proceed from *intestinal worms,* calomel with camphor, and the other cathartics noticed above; the occasional exhibition of an active terebinthinate draught, followed by enemata, containing aloes, assafœtida, camphor, &c., and subsequently, by the preparations of iron, as well as any other of the remedies and modes of combining them described in the article WORMS, may be directed. It is generally remarked by the German writers, that worms never form in the alimentary canal previously to weaning, if the milk be healthy; and the observation is confirmed by my experience. It is, therefore, after this period that convulsions can be referred to this cause.

82. *d.* The marked *hereditary* and *constitutional tendency* to convulsions in the same family of children, and the very frequent connection of this affection with cerebral irritation, or with dropsical effusion in the ventricles, or between the membranes, in such cases, have presented difficulties to every practitioner. I believe that the disease, when occurring in this manner, has been too frequently ascribed to inflammatory action, and a too lowering treatment adopted. Mr. HILL recommends the arsenical solution, with musk, in these cases; and I doubt not their utility, if carefully employed; but other tonics and antispasmodics, particularly the weaker preparations of bark, or calumba, with the liquor potassæ, and small doses of conium, or syrup. papav., or opium, if the child be not too young, and if the watchfulness or erithism of the brain be present, will be found still more serviceable, especially if the head be kept cool, the secretions and excretions carefully promoted, and the kidneys occasionally excited by the addition of diuretics to the tonics, as the spir. æther. nit., digitalis, syrup. scillæ, &c., or by the application of a suitable liniment (F. 311.) to the loins. In several cases of this description, I have directed, after other means had failed, and while tonics, as now prescribed, were given, the hair to be cut off, and the liniment to be rubbed upon the head immediately after the cold affusion. In cases connected with inflammatory irritation of the membranes, local depletions, the cold affusion, &c. (§ 67.) should precede the above treatment.

83. *e.* The *diet and regimen* of children that have once experienced a seizure of convulsions, ought to be carefully attended to. The stomach ought never to be overloaded, either by the mother's milk or by its ordinary food, which should be always recently prepared, and easy of digestion. As crying often brings back the seizures in infants and young children, it should be prevented as much as possible. When the bowels have been sufficiently evacuated by the medicines suggested, from one to three grains of the *hydrargyrum cum creta,* either alone, or with the sub-carbonates of the fixed alkalies, may be given at first every night and morning, and afterwards every night, or every other or third night. The head should be always elevated; and whilst in bed or indoors it ought to have no other covering upon it than that with which Nature has provided it. On no occasion should the warm fur or beaver hats, which are very improperly worn by children, be used; nor ought the mental powers to be prematurely or inordinately excited. In a word, the head should be kept always cool, the mind tranquil, the lower limbs warm, and the bowels open. A free, temperate, and healthy atmosphere, with occasional change of air, is also as necessary as medical treatment.

84. iii. TREATMENT OF PUERPERAL CONVULSIONS. — The more frequent occurrence of convulsions in a first pregnancy, during a protracted labour, in those who have experienced them previously; the period of the puerperal state, and the progress of the labour and state of the os uteri when they do occur; the characters they assume — whether those of eclampsia, of epilepsy, of hysteria, or of simple clonic convulsion; the causes which induce them, the circumstances connected with them, and the fact that they, more than any of the other forms of convulsion, are the result of active determination of the blood to the head — which, however, is merely the effect of irritation primarily seated in the abdominal viscera; are

all to be taken into consideration in the treatment of them. The *intentions of cure* are the same in this as in the foregoing states of convulsion; and they should be promptly fulfilled.

85. *A. In order to cut short the seizure,* — *α.* After having resorted to suitable means to protect the tongue, as the introduction of a cork between the teeth, &c., blood-letting from the arm, but preferably from the jugular vein, when it can be easily performed, should be employed, and carried at once to a decided extent relatively to the vigour and habit of body of the patient; and it should be repeated after a short interval, if the convulsions recur, and there be no circumstances to forbid it. Simultaneously with the flow of blood, or immediately after it, the affusion of *cold water* or the application of a bladder of *pounded ice* on the head, and the exhibition of ten grains of *calomel*, and from five to ten grains of *camphor*, previously reduced to a powder by a few drops of spirit, with or without an equal quantity of musk, and shortly afterwards of two or three drops of *croton oil*, should never be omitted. These medicines may readily be administered, by mixing them in sweet butter, and introducing a portion from time to time over the root of the tongue, upon the end of an ivory letter folder, or upon the handle of a spoon. A *cathartic* and *antispasmodic enema* (F. 141. 149.) should also be thrown up without delay; and immediately repeated, if it be returned. The combined effects of these will seldom fail of producing a solution of the paroxysm. My experience of the excellent effects of camphor is fully confirmed by Dr. Hamilton, although Chaussier expresses an unfavourable opinion of it, and of all heating antispasmodics; and the recently published observations of Mr. Michell are strongly in favour of musk, which he gives in doses of from one to two scruples. Depletion may be carried further in those states of the disease which assume the characters of eclampsia, or which are attended by great fulness about the head, or stertorous breathing, than in almost any other malady. Chaussier advises, after general depletion has been practised, local bleeding from the nape of the neck and occiput, or from the epigastric region.

86. *β.* As to the propriety of prescribing *opium* in puerperal convulsions, very opposite opinions have been given. Petit, Hamilton, Merriman, and Dewees consider it most injurious; Manning and Bland recommend it; and Leake and Burns, with a judicious discrimination, state, that when the disease is not accompanied with fulness of the vessels of the head, it may be exhibited with advantage after blood-letting. In this decision I concur, and add, that it should always be given either with camphor, as directed by Stoerck, or with the sub-carbonates of the alkalies, as advised by Stutz and Bruninghausen, or with both; more particularly when the convulsions occur from excessive irritability, or previously to the period of full gestation, or after delivery, or when they assume chiefly the characters of hysteria. Rinck applies it to the abdomen, and Hufeland to the soles of the feet.

87. *γ.* Some difference of opinion exists as to the propriety of exhibiting *emetics* in this disease. Denman is in favour of them, but Mauriceau, Chaussier, and Hamilton condemn them, unless after blood-letting, and when the seizure has been excited by improper ingesta, — the only circumstances under which, in my opinion, they should be given, and in which Dr. Blundell also recommends them. Of the good effects of *active cathartics* there cannot be the least doubt. I have always observed, as Dr. Merriman has stated, that the stools procured by them are morbid and offensive.

88. *δ.* The next practical point of importance is, whether or not the patient should be *immediately delivered*; and on this the sentiments of the most eminent accoucheurs are at apparent, rather than actual variance. No person will deny that the state of the uterus is connected with the cause of the seizure; therefore it would obviously seem requisite to remove that state. But the objecters reply, that convulsions also occur after delivery, when this state of uterus no longer exists: I have, however, never met with any, of several cases of convulsions after delivery for which I have prescribed, that did not arise from analogous causes of irritation, viz. an over-distended urinary bladder, the retention of the placenta or of coagula in the uterus, or the accumulation of fæcal or irritating matters in the bowels. I therefore would adhere to the opinion I have often given, namely, if the above means have failed, and if the labour be so far advanced as to enable the accoucheur to deliver immediately without force or injurious interference, then let it be done. If the labour be not so far advanced, but yet the *os uteri* is considerably dilated, then the membranes may be ruptured, particularly if they be very tumid, — if, indeed, they have not been already ruptured, which is often the case, — and either full doses of the *sub-borate of soda* (℈ j. to ʒ ss.) given, or the *ergot of rye*. If the os uteri be rigid or undilated, the former of these will be preferable. If, however, the labour has not proceeded far, then any interference, excepting by the exhibition of medicinal substances, may be more injurious than beneficial. La Motte, Osborne, Leake, Hamilton, Dubois, Ashwell, Nauche, Miguel, Burns, Osianders father and son, Duges, and Ramsbotham, are favourable to as early delivery as possible without violence; whilst Bland, Garthshore, Baudelocque, Hull, Gardien, Denman, and Blundell, are against forcible dilatation of the os uteri, and attempts at delivery in the early stage of labour. After all, the difference is more in words than in intention; for the general object is to hasten delivery, without injurious interference, if the labour be so far advanced as to render the attempt prudent; and those who have espoused either side have stated their opinions with such exceptions and limitations, and with so little precision, as to leave the subject nearly where they found it, and to render it no easy matter to ascertain under what circumstances they would either have recourse to art, or trust to nature. When the treatment already recommended fails, or is followed by an exasperation of the convulsions, — which will very seldom occur if it have been judiciously directed, — then I conceive that the active interference of art should be called to our aid. There is, perhaps, no subject on which opinions are stated to be so much at variance as on this, — each succeeding writer placing those of his predecessors in opposition, even where no real

difference exists, and thereby bewildering the inexperienced, in order that he may have the credit of giving a decision respecting it.

89. ε. Chaussier recommends, in rigidity of the uterine orifice, the application of a pomade containing *belladonna*, with the view of relaxing the spastic contraction, which, he states, is not limited to this part, but extends to the whole of the organ. I believe, however, that the body of the womb is generally free from spasmodic contraction. This preparation consists of two drachms of the extract of this narcotic, softened with an equal quantity of water, and triturated with about an ounce of prepared lard. A piece, the size of a small nut, is to be introduced into a female syringe, open at the extremity, and conveyed to the os uteri, where it is to be applied by pushing onwards the piston. In about half an hour the rigidity subsides, and the labour proceeds. Of this practice I have no experience. M. Chaussier discourages any other attempt at dilatation of the os uteri, as irritating the parts, and inducing a recurrence of the convulsions.

90. ζ. I have never omitted, in any case treated by me since 1819, to employ the affusion of a stream of cold water on the head, and the injection of turpentine clysters, sometimes with camphor, assafœtida, or valerian, and the results have been most satisfactory,—a much less quantity of blood having been detracted than is usually required in such cases. I am not aware that either of these two remedies had ever been employed in puerperal convulsions, until long after I had given publicity to the practice, — a practice which I know to have been recommended very recently by those, who, at that time, ridiculed it. In the more rare states of the disease, which are attended by a weak quick pulse, pale features, and hysterical symptoms, enemata containing valerian, assafœtida, or camphor, are very serviceable. In those which assume the comatose or apoplectic characters, *blisters* applied to the nape of the neck, and *sinapisms* to the ankles and calves of the legs, are useful adjuvants of the measures already recommended.

91. η. In all cases occurring previously to, during or after parturition, the state of the bladder, and of the bowels, ought to be carefully enquired into. Early in 1823, I was called to the Queen's Lying-in Hospital, by the house pupil, to a patient who had been seized with puerperal fever on the second day after delivery, but was convalescent from it, when she was attacked by convulsions, brought on by a distended urinary bladder. I found that the urine had been drawn off, and that she had been blooded once largely. The case was one of extreme severity and danger; the convulsions were unremitting, and attended by profound coma and asphyxy. The vein was re-opened, and, while the blood flowed, a stream of cold water was kept playing upon the vertex, and, at the same time, a clyster with turpentine and camphor was thrown up. Thus, the three most powerful — the almost only, remedies to be confided in, were simultaneously in operation. The patient rapidly recovered. Purgatives were given by the mouth, upon the solution of the convulsions; deglutition having been entirely abolished during the whole seizure. This was one of the earliest cases in which I had ventured upon the *simultaneous* employment of these powerful agents, the use of them in succession having been generally adopted by me previously. I allude more particularly to this case, because of its uncommon severity; of its occurrence soon after a most dangerous disease, as late as nine days after delivery, in a public institution, and at a time when my public recommendation of the practice apparently received but little attention; although it will not now be looked on with scepticism.

92. ϑ. Of *other remedies* but little may be said, as they should be viewed as auxiliaries merely. I have already expressed myself favourably of *camphor* (§ 85.). Burns condemns it; but, when exhibited after depletion, and at the same time with the cold affusion on the head, and cathartic and antispasmodic clysters, it is a valuable medicine. Under the same circumstances, musk, assafœtida, and the other antispasmodics, will also be of use; for all risk of their injurious action on the brain is prevented by the cold affusion, whilst they co-operate with the terebinthinate injections to excite the contractions of the body of the uterus, and remove spastic constriction of its neck. Of the *ergot of rye*, my experience is limited. I have given it only in one case of this disease, and then it was combined with *borax*, — a medicine undeservedly fallen into disrepute — but which I have prescribed for many years. The labour in that case proceeded rapidly, and the patient recovered. Much difference of opinion exists as to the effects of, and propriety of giving, the ergot in convulsions. If the os uteri be dilated, and the external parts free from rigidity, blood-letting, the cold affusion, and cathartic injections, having been actively but unsuccessfully employed, there can be no doubt of the propriety of exhibiting it. Opinions will always be at variance as to the benefits derived from substances recently introduced into practice; for, as all medicines are remedies only from their appropriate use, experience of their operation is required to ascertain the circumstances in which they are truly of service. In a case of puerperal convulsions — I believe the first in which the ergot was exhibited — Dr. Brinckle gave it after the means usually adopted had failed. Twenty minutes after the first dose had been taken, uterine action came on, and the patient recovered. It is strongly recommended by Dr. Waterhouse, of Philadelphia, and by Mr. Michell.

93. ι. In cases of unyielding rigidity or callosity of the os uteri, Van Swieten advised an *incision* to be made through its margin. Dubosc, and, subsequently, Lauverjat, Bodin and Coutouly, who considered it perfectly justifiable after blood-letting, the warm bath, and other means usually employed, had failed, have had recourse to this operation. M. Coutouly has recorded four cases (two of which are quoted by M. Miguel), in which it was resorted to; three of these recovered. The death of the fourth he imputed to the circumstance of it having been too long delayed. M. Nauche also favours this operation in the above circumstances, especially if emollient and narcotic injections into the vagina have failed to relax the rigidity.

94. κ. The *warm bath*, and emollient *fomentations*, followed by the use of an anodyne liniment on the abdomen, have been recommended by Denman and Nauche; and the *tepid bath* by

CAPURON, after bleeding has been practised. Much advantage will accrue from assiduous frictions of the abdomen, more particularly if they be performed with an anodyne and antispasmodic liniment (§ 53, 54.), independently of the use of a warm or tepid bath; for either of these can seldom be used with advantage in the circumstances of puerperal patients. In every case the hair should be cut closely off. This may be done in a very few minutes; but shaving the head is merely a loss of time. BURNS, RYAN, and CLARKE advise the application of a *blister* on the head; but I believe that it will be required only in extreme cases; it certainly ought to be ventured upon only in such, where the coma is profound, and the pulse weak, and the patient sinking. The advantages stated to have been derived by Dr. CLARKE from *acrid cathartics*, and clysters, are confirmed by my own experience. If the convulsions occur immediately after delivery, the placenta should be removed, and the existence of internal hæmorrhage enquired after — if at a later period, the state of the urinary bladder and bowels, as well as of the womb, demands attention. In all such cases, active purgatives and cathartic clysters are especially required, but the choice of them should be made with due reference to the state of constitutional power, and to the presence or absence of cerebral congestion, or of exhaustion and nervous susceptibility.

95. λ. When the convulsions attack *epileptic* females, they generally have all the characters of epilepsy or eclampsia, generally with unremitting sopor and stertorous breathing passing almost into asphyxy; and they require the treatment described above. When they occur in *hysterical* females, they may also assume the same forms, and demand the same method of cure; or they may present the features of simple hysteria, particularly borborygmi, quick pulse, &c., with very slight cerebral affection. In these latter cases, the nervine remedies mentioned in the next paragraph will be adopted with advantage, especially after the cold affusion on the head. Cold enemata may be also thrown up, as advised in HYSTERIA. In the majority of these seizures, neither bleeding nor artificial delivery is required, unless cerebral congestion supervene, or the patient be strong or plethoric.

96. μ. Convulsions in the puerperal states may occur from *great exhaustion*, from want and inanition, and *losses of blood*. In these, the practitioner should trust chiefly to the cold affusion, performed only momentarily; to the keeping of the head cool and elevated; to sinapisms on the lower extremities; to the exhibition of camphor, ammonia, the vegetable alkalies, and musk, with small doses of opium, or of the æthers with hyoscyamus or conium; to the administration of valerian, assafœtida, or turpentine clysters; to the warm bath; to anodyne frictions of the abdomen; and to as early delivery as may be safely attempted; the vital energies being supported by gentle cordials during the remissions. If the seizure be complicated with *hæmorrhage* from the uterus, or hæmatemesis, prompt artificial delivery, the turpentine clyster in the first instance, and turpentine draught in the second, are the most certain means.

97. *B.* The *prevention of puerperal convulsions* is of great importance. The means calculated to attain this object can be put in practice only when the premonitory symptoms (§ 28.) manifest themselves. — *a.* If these indicate fulness of the vessels of the head, *bleeding* from the arm, or cupping on the nape of the neck, will be necessary; and in every instance the bowels are to be freely evacuated. There are few cases of the disease, at whatever period it may occur, entirely unconnected with fæcal accumulations; and although this state of the bowels may not excite the attack, it certainly remarkably disposes to it. *Cathartics* should therefore be given by the mouth, and their action promoted by clysters. Dr. BLUNDELL advises an ipecacuanha *emetic* to be taken in the first instance; and, where there is a loaded or disordered stomach, this practice may be adopted. In addition to these, the *warm bath* may be used; and if, notwithstanding, signs of active determination continue, the *cold affusion on the head*, or cold applications, should be also resorted to, either previously, at the same time with, or subsequently to, the warm bath. Dr. HOME and Dr. BLUNDELL favour the exhibition of *digitalis* in such circumstances.

98. *b.* If the premonitory symptoms be characterised by leipothymia or *sinking*, rapid weak pulse, particularly of the carotids; coolness of head, sunk features, &c., — the internal use of camphor, or musk, ammonia, assafœtida, the æthers, the warm bath, with small doses of opium, purgatives, sinapisms, blisters, and the turpentine fomentation applied on the abdomen, are the most approved means of prevention.

99. *c.* If the patient have had two or three attacks at some former period, and if the above preventive treatment have not rendered the accession of the disease less probable, Dr. BLUNDELL advises the membranes to be punctured.

100. *C.* During *convalescence*, the states of the urinary bladder and of the bowels should be carefully watched, and evacuated; the diet regulated; and both body and mind kept tranquil. If cerebral symptoms continue for some time afterwards, the head should be preserved cool, and sponged with cold water night and morning, and a blister applied to the nape of the neck, and kept open for some time, whilst a course of eccoprotic and deobstruent purgatives is continued for several days.

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CORPULENCY. See Obesity.

COUGH.

— Syn. Βὴξ, Gr. *Tussis*, Lat. *Bex*, Good. *Pneusis Tussis*, Young. *Der Husten*, Germ. *Toux*, Fr. *Tossa*, Ital.

Classif. — 2. *Class*, Diseases of the Respiratory Function; 2. *Order*, Affecting the Lungs (*Good*). II. Class, III. Order (*Author*).

1. Defin. *Violent and sonorous expulsion of air from the lungs, preceded, rapidly followed by, or alternating with, quick inspiration.*

2. I. Pathology. — Dr. Cullen and several other nosologists have considered cough as chiefly a symptom, which undoubtedly it is most frequently; but I agree with Dr. Young and Dr. M. Good in believing that it is entitled to be viewed, on some occasions, as an idiopathic affection. Dr. Good, however, has ranked it as a genus, and comprised under it various affections, which are either merely slight forms of Bronchitis, or the results of organic changes in the Lungs, and which I have treated of in these articles, and in those on Bronchorrhœa, Catarrh, and Influenza. He has, moreover, subdivided it into more varieties than can easily be recognised in practice, and has viewed Hooping-cough as a species of the genus, instead of a distinct disease.

3. Causes. — Cough, in either of the forms about to be particularised, commonly attends disorders of the air-passages, and of parts in their vicinity, particularly of the larynx; also those of the lungs, and their membranous coverings; and sometimes diseases of other organs by which the respiratory functions are affected sympathetically — or rather, from continuity of tissue or nervous communication. It is thus occasioned by affections about the fauces, tonsils, pharynx, and neck; by the irritation of dentition; by diseases of the œsophagus, particularly when inflammation and ulceration of this part extends to, or penetrates, the membranous part of the trachea (Kappelhout, Mr. Byam, and myself); diseases of the spine and its contents (Wichmann); by cretaceous or calcareous formations in the ramifications of the bronchi (Morgagni, Bonet, Baillie, Portal, and myself in several cases, two of which occurred in gouty subjects); by all organic changes of the thoracic viscera; by the accidental passage of foreign substances, solid or fluid, into the air-passages; by the lodgment of the eggs or larvæ of insects in the same situation (Vogel and Percival, &c.); by the irritability of parts attendant upon the nervous temperament and debility; by the influence of irritation and imagination, — a cause which did not escape the observation of the acute Montaigne; irregular or misplaced gout; the irritability of the parts continuing some time after measles, or inflammations of the air-passages or lungs; disorders of the digestive organs, particularly the stomach and liver, &c. (Winther, Stein, Percival, &c.); by accumulations of bile in its receptacle; by the irritation of worms; by the repulsion of cutaneous eruptions, and the healing of old sores, and suppression of chronic or accustomed discharges. From this enumeration it is evident that cough is chiefly a symptom of numerous pathological states, which will be found very fully described under different heads, as indicated above. The *epidemic cough* noticed by some writers falls under the article Influenza. In the act of coughing, the

lungs are passive; and in the *idiopathic* states of the disorder they are not organically affected; the disorder being chiefly seated in the *trachea*, *larynx*, and vicinity. In very many cases, the irritation occasioning the cough exists chiefly in the posterior *fauces* and *pharynx*, and extends no further than the epiglottis and *rima glottidis*.

4. i. *A*. DRY COUGH occasionally occurs in an *idiopathic form*, — *a*. From exposure to cold in any form; the attendant symptoms not amounting to complete CATARRH; and it may, or may not, in a very short time terminate with slight mucous expectoration. When, however, it arises from this cause, it usually runs the course described in that article. *b*. It is occasionally produced by acrid or acid fumes and gases, or by various foreign substances inhaled, or accidentally passed, into the trachea, and from several of the other causes enumerated above (§ 3.). *c*. It also, in some cases, — first noticed by MONTAIGNE, and well described by WHYTT, — presents a strictly *nervous* character, particularly in nervous, hysterical, and irritable persons. *d*. In those especially, and also in feeble or delicate constitutions, a short, frequent, and dry cough is sometimes met with, without any disease of the lungs, air-passages, or other organs; and the only change that can be detected is slight redness at the margin of the soft palate, or in the posterior *fauces*; sometimes only in the *pharynx*; and occasionally near the *tonsils*; but this is not uniformly, although frequently, observed. Here it is obvious that the irritation of these parts extends to the glottis, or to the epiglottis only; and that it is either strictly local, or connected with slight derangement of the stomach and prima via. In the former case it is idiopathic, in the latter symptomatic, or at least a complicated ailment.

5. *B*. *Dry cough* is more frequently *symptomatic* — *a*. Of the first stage of diseases of the larynx, trachea, and lungs; of organic changes of the large blood-vessels of the chest; and sometimes of complaints of the more superior of the abdominal viscera. *b*. It is frequently occasioned by *elongation* of the *uvula*, and the irritation this part produces about the root of the tongue and epiglottis. But when the uvula is elongated, there usually is also more or less coexisting irritation about the posterior *fauces* and *pharynx*, extending to the glottis or epiglottis. And it should be, moreover, kept in view, that these ailments are principally dependent upon, even although they may not be always produced by, disorder of the stomach and digestive organs generally. *c*. In many instances, also, it will be found that the cough is owing to irritation of the *mucous surface* of the *stomach* and *œsophagus*, although it may not extend so far as to be apparent in the pharynx, or be so severe as to occasion redness of this part. *d*. Cough is often produced by *diseases of the liver*, and by collections of bile in the *gall-bladder* and hepatic ducts. In many of such cases, the cough is severe and spasmodic, often very obstinate and of long duration; the symptoms of hepatic disorder being sometimes so slight as to escape detection, unless the attention of the practitioner is awakened to the connection; the chief indications of its existence being the loaded or furred tongue, pains about the diaphragm, fulness at the epigastrium, and indigestion. *e*. Lastly, dry cough is often occasioned, in young and delicate patients, by the irritation of *worms* in the prima via. The more particular consideration of these associations will be found in the articles on the diseases of which the cough is merely a symptom.

6. ii. HUMID COUGH, — *a*. may follow upon the preceding; or it may occur primarily from the usual causes of catarrh. In such cases, it is merely a slight form of that affection, the matter expectorated being mucous or serous, and the cough unattended by manifest febrile or constitutional disturbance. This form of cough is very liable to recur, or become chronic, in delicate persons, during the winter (*winter-cough*); or from vicissitudes of season and weather; and, like the former variety, the irritation exciting it may be chiefly seated in the pharynx and vicinity, or in the larynx and trachea. In many cases the serous, or sero-mucous secretion, following the cough, entirely proceeds from the fauces and vicinity. *b*. In old persons, however, it is secreted chiefly by the bronchial surface, and is then, particularly in its more severe forms, the affection described under the name of *Bronchorrhœa*. *c*. Humid cough is generally less frequent, but more prolonged, and recurs in severe paroxysms. It is sometimes complicated with rheumatism and gout. It also presents the same pathological relations as described in connection with the dry variety; but it is not so often symptomatic of diseases of the abdominal viscera, as the foregoing. *d*. In the old and weak, humid cough is usually very severe, owing chiefly to the want of vital power of the respiratory organs, and of the system generally, to throw off the mucus secreted in the air-passages; and which is either very abundant, from the relaxation of the extreme vessels; or very tenacious, from absorption of its more fluid parts during its retention on the surface that secreted it, or from both conjoined. In such cases, the paroxysms of coughing are very severe and prolonged; and the affection is liable to be exasperated upon every change of season and weather. *e*. In other cases of humid cough, the exacerbations are also very severe, particularly in the morning; but the excretion is thin and frothy. This is observed most frequently in persons addicted to intoxicating beverages; and in those debilitated by sexual indulgences. When humid cough depends upon hepatic disease, it often assumes this form.

7. II. TREATMENT. — i. *A*. The *idiopathic states of dry cough* require demulcents, emollients, with diaphoretics and narcotics or anodynes (see F. 238. 244. 389. 426., and ℞ 98. and 99. at p. 297.). The conium, hyoscyamus, solanum, œnanthe, and phellandrium aquaticum (THEUSSINK and FRANK), may severally be employed, and the functions of the abdominal viscera improved by suitable means. But the pathological states, as well as their causes, on which this form of cough depends, should be investigated, and the treatment modified accordingly. *a*. If it follow the impression of *cold* in any form, the treatment described in the article CATARRH (§ 15.) will be appropriate. *b*. If it be produced by the inhalation of *irritating fumes*, or the molecules of either mineral, vegetable, or animal matters floating in the air, the removal of the cause, and the use of demulcents, emollients, and emetics, and subsequently narcotics, are most to be depended

upon. *c.* When it assumes a *nervous* character, particularly in hysterical and delicate females, the state of the uterine functions, and the existence of irritation in some part of the digestive tube, or in the sexual organs, or spinal chord, should be enquired after, and the treatment directed according to the information acquired. In many such cases, the exhibition of a gentle purgative, and afterwards small doses of camphor, ipecacuanha, ammonia, oxydes of zinc and bismuth, hyoscyamus, extract of hop or poppy, the sub-carbonate of soda, &c. variously combined, will be of service. If there be evident debility, and the cough assumes a periodic form, the preparations of bark or of iron, the sulphate of quinine, or gentle tonics, with anodynes and narcotics, will be required. The cold bath, which has been much recommended by Whytt, will also prove beneficial. *d.* When it proceeds from irritation of the *fauces* or *pharynx*, demulcents, emollients, &c. with ipecacuanha, or with diaphoretics and anodynes, will be required. But the greatest advantage will be derived from the use of cooling and astringent gargles, and stomachic purgatives (F. 266.).

8. *B. The symptomatic occurrence* of cough must be treated as pointed out in the articles on the primary affections occasioning it.— *a.* If it be referred to the respiratory organs, the means appropriate to their diseases must not be departed from. *b.* When we observe elongation of the uvula, either with or without signs of irritation of the pharynx, disorder of the digestive functions may be inferred; and, after having had recourse to purgatives, cooling and astringent gargles, prussic acid, and mild stomachics will be useful. *c.* The dependence of cough upon diseases of the *biliary organs*, whilst it suggests a treatment chiefly directed to these diseases, will also indicate the propriety of ascertaining, with as much precision as possible, their nature. If indications of accumulated bile in the gall-bladder and hepatic ducts are detected, calomel or blue pill, with, or followed by, purgatives, and a course of alteratives, taraxacum, &c. will be requisite. In some cases, a gentle dose of either of these chologogues will produce copious discharges of morbid bile, and the immediate disappearance of a constant, severe, dry, and harsh cough, of which alone the patient has complained. In others, repeated and large doses will be required to accomplish this object. In all these, purgatives should be exhibited until the tongue becomes clean. If tenderness or pain exist in the region of the liver, with febrile symptoms towards evening, or restlessness through the night, blood-letting, general or local, ought to precede other measures; and the hepatic disease should be treated with reference to the form it presents, and as described in the article on *Diseases of the* Liver. *d.* When the cough is attended by a tumid abdomen, and other signs of *worms*, the treatment recommended in such cases, according to their numerous modifications, must be employed.

9. In almost all the idiopathic and symptomatic forms of dry cough, more advantage will be obtained from demulcents, than from heating or stimulating expectorants, which should always be laid aside when there is evident vascular excitement of a sthenic or tonic kind. Those expectorants, however, which are of a mild nature, or which act chiefly by exciting slight nausea, will generally be of service, particularly when combined with emollients, diaphoretics, and narcotics; and there are few conditions, in which the preparations of antimony or ipecacuanha, with liquor ammoniæ acetatis, and the warm bath, will not be extremely beneficial. In this variety of cough, also, appropriate medicines, exhibited in such a manner as will favour a prolonged impression on the palate and pharynx — as in the form of *lozenge* or linctus — will thereby have their effects manifestly promoted; and advantage will also accrue from wearing warm, antispasmodic, or rubefacient plasters between the shoulders, both in this and the humid variety of the affection.

No. 160. ℞ Confect. Ros. Canin. et Confect. Ros. Gal. āā ℥ j.; Olei Amygdal. Dulc. ʒ vj.; Syrup. Papaveris Albi ℥ ss.; Spirit. Æther. Nit. ʒ ij.; Acidi Sulphur. dil. ʒ jss.; Pulv. Ipecacuanhæ gr. ij. M. Fiat Linctus, de quo sumatur pauxillum subindè.

No. 161. ℞ Emplast. Picis Comp. part. ij.; Emplast. Ammoniaci (vel Emp. Ammon. cum Hydrarg.) et Emplast. Opii āā part. i. M. Fiat Emplastrum perlargum inter scapulas impositurum.

10. ii. *Humid cough*, when it presents the characters of slight *catarrh*, requires the treatment described in that article. *a.* If it frequently recur, or become *chronic*, or assume the form of winter cough, the more tonic demulcents, as the decoction of Iceland moss, or of the sea moss, with lemon and candy, — the mistura ferri compos. with a decoction of liquorice root, — attention to the digestive and excreting functions, — warm clothing, — and careful avoidance of exposures to the vicissitudes of season or weather, — are most to be depended upon. *b.* When the cough occurs in old persons, with increased secretion obviously from the bronchi, gentle tonics, and expectorants, as myrrh, galbanum, assafœtida, benzoin, the oxide or sulphate of zinc, the terrebinthinates, camphor, ammonia, the balsams, and, indeed, the whole of the treatment described in the articles on Chronic Bronchitis (§ 91.) and Bronchorrhœa are most appropriate. *c.* When it is complicated with *gout* or *rheumatism*, purgatives, combined with tonics or stimulants, in order to carry off collections of morbid bile, and other vitiated secretions; and afterwards the medicines now enumerated, or the preparations of ammonia or camphor, combined with colchicum will generally afford marked relief. The dependence of this variety upon the diseases already noticed as occasioning the other form of cough, requires the several measures pointed out with reference to each of them (§ 8.). *d.* If the cough be very severe, in *old and exhausted persons*, and in those who have injured their constitutions by venereal indulgences, a tonic and stimulant treatment, and the remedies instanced in this paragraph in increased doses, will be requisite. It will be found in these, as well as in *broken-down drunkards*, that the cough will be aggravated by remedies which in any way depress the vital energies. In these last, the cough is frequently connected with hepatic disease, the treatment of which will depend upon its nature; but, although depletion may be occasionally required for the primary malady, the powers of life must be at the same time supported.

11. In this variety, generally, the mild expectorants, with demulcents; the jelly of sub-acid fruits; the inhalation of emollient, stimulating, or astringent vapours (see Bronchitis, § 76. 98.);

the use of acid beverages; warm, rubefacient, stimulant, and tonic plasters; the warm bath, made gently stimulating by salt and mustard; a light, demulcent, and nutritious *diet*, with strict attention to the functions of the stomach and bowels; change of climate, or of air, and a judicious choice of residence according to season, with gentle but regular exercise, and warm clothing; are severally of advantage, and some of them of the utmost importance. (See BRONCHI, § 104.).

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COW-POX. See VACCINATION.

CRAMP. See CONVULSIONS (§ 4.), SPASM, and TETANUS.

CRANIUM.

— SYN. Κρανίον (from κρανος, a helmet, as defending the brain from injury). *Die Hirnschale*, Ger. *Le Crâne*, Fr. *Cranio*, Ital. *The Skull.*

CLASSIF. PATHOLOGY. — *Special Pathology — Morbid Anatomy.*

1. The cranium and its envelopes, the scalp and the pericranium, are often the seat of diseases which are of much moment, not only as respects these parts themselves, but also as regards the important organs and membranes which they contain.

2. I. DISEASED APPEARANCES OF THE ENVELOPES OF THE CRANIUM. — These are principally the same as are observed in analogous structures in other parts of the body. Nearly the same changes are remarked in the *scalp*, and subjacent cellular tissue, as in the integumental coverings of other parts; and in the *pericranium*, as in other parts of the periosteum. These structures, forming the envelopes of the cranium, will, therefore, require but little remark.

3. *A*. The *scalp* is subject to the same inflammatory states as other parts of the body; and these require the attention of the physician, from their occasional extension to the bones of the cranium and membranes of the brain. Inflammations of the scalp vary in character with the condition of the vital energies and digestive and biliary organs. Sometimes this structure is the seat of active *phlegmonous inflammation*, but more generally of the erysipelatous. When erysipelas attacks the scalp, a copious exudation of a serous or sero-albuminous fluid takes place in its subjacent cellular tissue. Occasionally this tissue is affected by inflammatory action of an unhealthy kind, but limited in extent, and closely resembling *carbuncle*, and of which I have met with some cases in children. The scalp is also particularly liable to certain specific inflammations of a chronic kind, especially to pityriasis, porrigo, sycosis, lepra, psoriasis, eczema, rupia, and syphilitic ulceration. Tumours, generally encysted, sometimes form beneath the scalp, most frequently between it and the tendinous expansions of the occipito-frontalis, and other muscles attached to the pericranium. These expansions, and the muscular structure attached to them, and perhaps occasionally the pericranium also, are often the seat of rheumatism and rheumatic inflammation. They are not infrequently, also, affected by common inflammation and its consequences, particularly after external injuries. Dropsy of the cellular tissue beneath the scalp, independently of inflammation, is very rare. It has, however, been observed in young subjects, and received the appellation of *hydrocephalus externus*, and *œdema capitis*.

4. *B*. The PERICRANIUM is subject to the same changes as the periosteum in other parts of the body; amongst these are chronic and specific inflammations, giving rise to thickening of the membrane; to nodes, frequently terminating in suppuration and exfoliation of the subjacent part of the bone; and, in cases still more chronic and slight, to unnatural deposits of bone upon the external surface of the skull. (See PERIOSTEUM — *Inflammation of*.) Inflammations of an acute or sub-acute character sometimes, also, attack this structure, and, when not arrested in their progress, give rise to its separation from the bone; and not infrequently, owing to the extension of the morbid action through the tables of the cranial bones, to a corresponding separation of the dura mater from the diseased part of the skull. It seems probable that morbid action of any kind is seldom continued long in the pericranium, without the dura mater, which performs the office of an internal periosteum, suffering in a corresponding degree, and ultimately transmitting the disease to the subjacent membranes, and even to the brain itself. Specific inflammation also of this structure, of a most painful and dangerous kind, occasioning death of the portions of bone beneath the parts chiefly affected, is produced by syphilis and the inordinate and prolonged use of mercury.

5. II. MORBID CHANGES IN THE CRANIUM. — The bones of the cranium are subject to various diseased appearances, many of them having a close reference to the state of the system, and its morbid dispositions, and still more so to those slowly formed lesions which frequently affect the brain and its membranes. — *A. Enlargement, or rather distension*, of the bones of the cranium, is frequently an attendant upon chronic hydrocephalus, and the hypertrophy of the brain sometimes accompanying rickets. When the accumulation of fluid is great, and has taken place before ossification is far advanced, this process frequently commences at several more distinct points than in the healthy state, thus generating as many distinct bones. In the majority of these cases, although the surface of the cranial bones is greatly extended, there is a general deficiency of the ossific deposit, rendering the skull more than usually thin. The Museum of Guy's Hospital contains the cranium of an hydrocephalic man, who lived to the age of 29 years. Its circumference is 33½ inches. There is also in the

Museum of St. Thomas's, the skull of a child of two years, that measures 29 inches.

6. *B. Deficient deposit of bone,* as now remarked, is often connected with the foregoing lesion; in which case it is commonly general, the whole cranium being more or less thin as well as enlarged: but the thinness may also, although less frequently, accompany a natural-sized skull. The deficient deposit, or thinness of bone, may also be partial. In this case, partial or circumscribed accumulations of serum, or tumours, generally exist beneath the part of the cranium thus changed; and we have reason to believe that it is to the pressure exerted by these that the unusual thinness is to be imputed. It should, however, be kept in recollection that the cranial bones vary exceedingly in thickness, without having seemingly diverged from the healthy state.

7. *C. Imperfect ossification* is chiefly a lesion of early age, being merely a slow or impeded developement of the bones, arising from one or both of the following causes: — *a.* From deficient powers of the constitution, in which the process of ossification either generally or locally in respect of the cranium participates; *b.* From the distension arising from the accumulation of fluid. The imperfect ossification in such cases may continue to the age of three, four, or five years, and generally consists merely of a more than usual openness of the sutures, or a deficient deposit of bone at the parts most remote from the centres from which the ossific process proceeds. In some cases, however, the imperfection exists in about the middle of one of the bones; a patch of membrane, or a narrow stripe being surrounded by bone. When these patches or clefts in the bone are considerable, or remain for any time unfilled up, a portion of the membranes often protrude, forming large watery tumours, owing to the pressure of fluid effused between or underneath the membranes,—a circumstance which occasionally obtains. An interesting case of this description, successfully treated by ligature, has been recorded by Mr. E. Thompson. The majority of these cases are congenital, but the protrusion is often not noticed until long subsequent to birth. Sometimes a portion of the brain itself protrudes, forming a congenital hernia cerebri.

8. *D.* The bones of the cranium may be *insufficiently evolved.* In this case they are generally formed with more than sufficient rapidity, and their sutures are closed prematurely, so that they cannot give way before the growing brain, which thus becomes, with the case enclosing it, imperfectly evolved. The cranium may thus appear *unnaturally small,* as is sometimes observed in idiots and epileptics; but this state may arise not only from early closing of the sutures, but also from imperfect developement of the brain itself. *Microcephalia* was considered by Hippocrates as a cause of idiotcy; and facts, showing that great diminution of the size of the head is very generally connected with weakness or privation of intellect, have been adduced by Greding, Gall, Spurzheim, Georget, and many others not believers in the doctrine of Gall.

9. *E.* The *shape* of the cranium is often somewhat changed by these and other causes. When the cranium is much *deformed,* it is more commonly a congenital vice arising either from the pressure in utero of a deformed pelvis, pelvic tumours, &c.; or from deficient developement, early disease of the embryo, and monstrosity; or from congenital change of the structures which it contains. But deformity of the cranium may also take place after birth, from deficient or irregular developement of the brain, or from the effusion of fluids in the cranial cavity. The early closing, also, of some sutures, and the protracted closing of others, whereby the yielding of the bones is prevented in one part, and facilitated in others, are often productive of deformity. Rickets, dropsy of the brain, softening of some of the bones, particularly of the base, whereby it is thrust up into the cavity (Otto), cretinism, &c., are all often productive of deformity. A species of deformity has several times come before me, and generally attended by epilepsy, and idiotcy, which I have seldom seen noticed. This consists of *obliquity* in the halves of the cranium; one half being much more depressed, both at the top and base of the skull, than the other. This deformity is sometimes thus simple, consisting only of comparative elevation and depression of the sides of the cranium. But I have observed it more commonly connected with an equal obliquity posteriorly and anteriorly; the elevated or depressed half, either receding or advancing much more than the other. In cases of this description, the cranium has also presented a certain angular form, so that I have been led to denominate the appearance, the *diamond-shaped obliquity* or deformity of the skull.

10. *F. Hypertrophy, thickening, or enlargement of the bones,* assumes two principal forms. 1st, That of a *superabundant deposit* of the ossific matter, giving rise to uncommon density, and to the disappearance of the diploe, and converting both tables of the skull into one dense bone, resembling, but much harder than, ivory. This appearance of the cranial bones is almost natural to the negro. It is observed, also, in persons advanced in life, who have been subjected to laborious employments, physical and mental; and it is often seen in epileptics, in maniacal epileptics, and in some who have been long insane. It may or may not be accompanied with increased *thickness* of the bone. Greding found the skull too thick in 151 out of 196 insane persons; and Georget observed it one twentieth and upwards too thick in 480 out of 500, belonging to the same class of patients. The second form of enlargement is rather the result of a loose or spongy formation of the bones, in which, although most remarkable in the diploe, both tables of the bone often participate more or less. In this form, the actual quantity of bony matter is not much augmented. Increased thickness of the bone generally obtains here, and sometimes reaches an enormous extent, and closely resembles in appearance a piece of pumice stone.

11. *G. Irregular deposits of ossific matter* are very frequently observed on both the internal and external surfaces of the cranial bones, particularly the former. They are often found adjoining the sutures, sometimes with a mammilated appearance on the external surface. On the internal surface, they frequently assume an irregular botryoidal form; sometimes they present large masses, particularly on the frontal bone, and encroach considerably upon the cavity. Not

infrequently these deposits are prolonged into the form of irregular processes: occasionally the prolongation is in the seat of particular parts or processes, as in the clinoid process. These exostoses are sometimes very prominent and acute. In some instances they encroach upon the foramina through which the nerves and vessels pass. In these cases, symptoms of pressure or of irritation are present, and vary according to the seat, form, and extent of the ossific deposit. Epilepsy, insanity, irregular convulsions, spasmodic contractions, and neuralgia, are amongst the most prominent effects of these productions.

12. *H. Vascular engorgement* is sometimes observed in the cancellated structure forming the diploe, in cases where great congestion, or very active inflammation, has existed in the head, membranes, or pericranium; the vessels passing from or into the bone being congested, and the diploe of a deep or purplish red colour.

13. *I. A softened state of the diploe* is not infrequently observed in cases where active inflammation has affected the pericranium, or dura mater, and extended to the bone. In these cases the tables of the bone are more friable than natural. A similar appearance is also observed when the system has been much contaminated by carcinomatous disease.

14. *K. Ulceration* of the cranial bones is also not uncommon; and is generally attended with more or less absorption, exfoliation, and the deposit of irregular bony spiculæ. Ulceration and absorption result very frequently from lupus, and the formation of bony spiculæ generally attends upon osteosarcoma.

15. *L. Caries, or death, of the bone* is not infrequently observed to follow upon inflammation extending from the pericranium, or dura mater, to the bony structure. It is a very common consequence of inflammation of the ear long neglected, or imperfectly treated. It may be limited to either of the plates, or it may extend to the whole thickness of the bone. In either case, the dead part is detached from the living by the absorption which takes place around it, and in the surrounding inflamed and ulcerated parts. Owing to this process, a distinct line of separation is frequently formed, and the dead portion is completely exfoliated. While the dead bone is being removed in this manner, or after its removal, if the dura mater, which acts as the periosteum of the internal table, is not destroyed, new bone is deposited, and thus the mischief is often repaired. — I have met with two such cases in children.

16. *M. Fungus cranii*, or *medullary sarcoma* of the bones of the skull, is occasionally observed. It has been described as occurring on the top of the cranium by Crell, Sandifort, Wishart, Abercrombie, Landmann, and Otto. A distinct tumour is often produced by it on the internal as well as the external surface of the skull, — the part forming a spongy growth. It is more rarely met with about the base of the cranium. It may originate in the bones, or their internal or external periosteum; but, in whichever of these it may commence, it soon involves them all. When originating in the bones, it usually assumes the characters of *osteosarcoma*, and those of *fungus* when it commences in the pericranium or the dura mater.

17. *N. Perforations* of the cranial bones are also observed, generally as a consequence of the pressure of internal tumours, of an encysted, scrofulous, or fungoid description, attached to the membranes underneath, or of aneurisms, &c. Cases of this description are recorded by Palletta, Le Clerc, Richter, Pelletan, and Otto. After artificial perforations of the skull, as after trephining, and fractures with loss of bone, osseous matter is sometimes regenerated, radiating from the surrounding divided surface of bone. The exuberant formation of ossific matter after fractures of the cranium is sometimes productive of serious effects. (See § 11.)

18. *O. Depressions and fractures* require little notice further than that they are the most frequent causes of inflammation, and its consequences in the surrounding membranes, and contained organs, and of irregular bony depositions. Depression of the superior and lateral bones of the skull may take place in early age to a very great extent, and remain through life, without affecting the mental manifestations. Several instances of this have come before me, in some of which the depression was fully larger and deeper than the bowl of a large table-spoon. One of my earliest and most talented friends has a depression to this extent in one of the parietal bones, from an accident in childhood.

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CRETINISM. — Syn. *Cagots*, *Struma Tyrolensium*, Gautier. *Crétin*, *Crétinisme*, Fr.

Classif. — 6. *Class*, 1. *Order* (*Good*).
I. Class, IV. Order (*Author*).

1. Defin. — *Imperfect formation or developement of the cranium, and the whole of the body, with mental imbecility, and physical imperfection, varying chiefly in degree.*

2. This state of imperfect physical and mental developement, rather than of diseased action, was first noticed by Plater among the poor of Carinthia and the Valais, where, and in the valleys of the lower Alps and Switzerland, it is endemic. But it is not peculiar to these places; for it has been observed in the valleys of the Pyrenees by Raymond, in some parts of Salzbourg by Knolz, and in various other localities in the central and southern countries of Europe, as well as in Chinese Tartary, according to Sir G. Staunton.

M. De Saussure, Ackermann, Fodéré, Iphof, Erhard, the Wenzels, and Knolz, have given us the best descriptions of this state of mental and bodily deformity, in respect both of its nature and causes. The brief account of it by Dr. Good is both imperfect and erroneous, and must have been written in perfect ignorance of the descriptions of the above eminent observers, as well as of others deserving of perusal. He very inaccurately associates it with bronchocele on the one hand, and with rachitis on the other; with the former of which it is not necessarily, although very frequently, connected, and from the latter it is totally distinct.

3. I. Description.—Cretinism presents various modifications in kind, and every intermediate grade between that extreme degree of physical and mental debasement which is characterised by the utmost deformity and entire absence of mental manifestation, the organic or vegetative functions only being performed, and that condition which may be considered as very nearly approaching the healthy constitution of man. There are certain circumstances which distinguish cretins from other idiots, viz. *a*. They present certain bodily deformities, which are seldom or never observed in other idiots; and, *b*. Their physical and mental infirmities are always the result of endemic causes.

4. In general, some degree of goître is attendant on cretinism, but not invariably. Professor Knolz states that it is sometimes absent, and occasionally slight, the thyroid gland being enlarged in no greater proportion than several other glands are in the same subject. The stature is seldom above four feet and a half, often much less; the cranium is deformed and has a conical shape — the forehead being thrown backwards, narrowed, and flattened, and the occiput being nearly on a line with the neck; the flesh is soft and flaccid; the skin wrinkled, yellowish, or pale and cadaverous, dirty, and covered by chronic eruptions; the tongue is thick, and hanging out of the mouth, which is open, large, and slavering; the lower jaw is elongated and prominent; the eyelids are thick, the eyes red, small, but prominent, watery, and frequently squinting; the nose is flat; and the whole countenance is idiotic or expressive only of lasciviousness. The belly is large and pendulous; the neck either short and thick, or long and thin; the limbs crooked, short, distorted, &c.; and the gait imperfect and waddling. The senses are more or less defective, or altogether abolished; the cretin being often deaf and dumb, and those who possess the faculty of speech expressing themselves imperfectly and with difficulty. The intellectual functions are either entirely absent or imperfectly developed, whilst the organic or vegetative functions are in a state of increased activity; cretins being voracious, lascivious, and addicted to masturbation. They appear to have no other enjoyment than eating and sleeping; and their insensibility is often so great, that they obey not the calls of nature. In some instances, the bodily deformity is not so remarkable as that now described; imbecility, flaccidity of the soft solids, with bronchocele, constituting the extent of infirmity.*

5. The cretin, like most idiots, seldom attains an advanced age; indeed, few of them reach upwards of thirty years. Clayton remarks, that although they die early, they soon present the appearance of age. They are usually of the lymphatic temperament, with light hair and grey eyes; the female cretin having enormously large and pendulous breasts. The less debased among them marry, rarely with one another, but do not propagate cretinism, the predisposition only to it being derived by the offspring from the parents. Malacarne (*Mém. de l'Acad. de Turin*) attributes the mental debasement to the contraction of the bones of the cranium, which prevents the cerebral organs from acquiring their natural dimensions and functions; and Ackermann espouses a nearly similar opinion. The conformation of the body is generally stated not to be congenital, although, at birth, the cretin may appear weak, puny, or sickly. It usually comes on gradually from birth; and M. De Saussure states, that children who, living in the localities where it is endemic, and are not affected at eight or ten years, generally escape it; and that infants who are brought into these districts at a very early age, are equally subject to it with those who are born in them.

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* The following account of the "*Fexes*," or cretins of Salzbourg, is abridged from that given by Professor Knolz: — The whole body is stunted, its height not exceeding four feet. There is a total want of due proportion between its different parts: the height of the head, with reference to the rest of the body, being 1-4th or 1-5th, instead of 1-8th, the natural proportion. The neck is strong, and bent downwards. The mammæ are very voluminous and pendent; the upper limbs reach below the knees; the arm is shorter than the fore-arm; the chest narrow; the abdomen hemispherical, and of a length not exceeding the height of the head; the penis and scrotum come down to the knees; the thighs are, with the haunches, of a greater width than the shoulders, and are shorter than the legs, the calves being almost wanting; the foot is small, and the toes partly distorted; the lower extremities are shorter than the upper half of the body. In the head, the masticating organs, the lower jaw, and the nose, preponderate considerably over the organs of sense and intelligence. The skull is depressed, and forms a lengthened and angular ellipsis; the receding forehead presents, internally, large frontal sinuses, to which the brain has yielded a part of its place; the top of the head is not vaulted, but flattened; the occiput projects but slightly, and runs almost even with the nape of the neck, as in ruminating animals. The face is neither oval nor round, but spread out in width; the parts of which it is composed being wide and short, and the maxillary bones projecting greatly. The forehead is narrow, flattened, and low; the eyes are unusually far apart, diverge slightly, and are small, and seated deep in the orbit; the pupil is contracted, and not very sensitive to light; their external angles are situated higher than the internal; the eyelids, unless when dropsically swollen, are flaccid and pendent; the look is a fixed stare without expression, and turns with indifference from all that is not eatable. The root of the nose is widened and depressed, the bones of the nose square; the zygomatic bones are wide, and extremely projecting: the external ear is large, stands out from the head, and hearing is very defective. The elongated form of the lower jaw of the cretins, and their thick and padded lips, make them resemble ruminating creatures more nearly than man. The tongue is thick, and rather cylindrical than flat; the saliva is continually running from the angles of the mouth. Enlargement of the thyroid gland is recognised as one of the signs of cretinism; but its size is no sure guide to the extent of the existing infirmity. The throat presents, also, other obstructed glands. The thorax is generally narrow and flat; the abdomen is usually distended with gases, and largely developed towards the chest; the flesh of the extremities is flabby; the knee of an irregular shape, and usually bent; the fingers are very long and lank, and the nails very small. The upper part of the vertebral column being directed more or less forward, and the lower part, with the basin, being pushed backward, the sacrum assumes a more horizontal, and the other pelvic bones a more vertical position, than in the healthy formation. Besides the masticating and digestive organs, those of generation are also strongly developed, especially in the male. (*Medecin. Jarbucker des k. k. Æsterr. Staates*, b. i. st. 1. 1829, p. 86.)

6. II. Causes.—The principal, if not the only, cause of cretinism is dwelling, during infancy and childhood, in deep, narrow, moist, and malarious valleys, situated at a lower level than 3000 feet above the ocean, where the air is stagnant, and the solar beams intercepted by the mountains. MM. Ferrus, Georget, and the authors already referred to, state, that cretins become numerous in proportion as the valleys sink below this elevation. In addition to those causes, may be added the poverty, ill-feeding, drunkenness, indolence, dirtiness, sensuality, and low debauchery of the parents,—circumstances tending to the production of an infirm and deformed offspring; the inactivity and filth into which children who begin to evince signs of cretinism are allowed to sink, and the influence of water holding calcareous and other mineral substances in solution. MM. De Saussure and Fodéré, however, deny that the water is concerned in the production of this infirmity; but MM. Bally and Rambuteau show that much is owing to it in the causation of cretinism, as well as Bronchocele (see that article). The last named authority states that the offspring of the natives of Valais, who intermarry with persons from the Italian side of the Alps, are more subject to cretinism than those born of native parents; that females who have husbands from the higher Alps seldom have children affected by this infirmity; that wherever cretins are seen, goître is also prevalent; but that the latter is found in places where the former does not exist; and, consequently, that the same causes that occasion goître, when present in an intense degree, also produce cretinism.

7. III. The Treatment of this infirmity is necessarily preventive rather than curative, and consists of the amelioration of the physical and moral condition of the parents; of the removal of infants, as soon as signs of the malady manifest themselves, to more elevated and open localities, and to mountainous districts, to enjoy a purer air and stronger light; of obliging them to exert themselves in some useful and suitable employment, and to pay attention to personal cleanliness; of frequent ablutions, followed by active and stimulating frictions of the whole surface of the body; of the use of stimulating tonics (Erhard); and of allowing them a stimulating and strengthening diet, with a large proportion of animal food. Josias Simler, who wrote in 1574, states that the malformation, constituting the physical infirmity, is sometimes congenital; and probably it is so occasionally. In such cases, it is not likely that much advantage will accrue from any means. M. Rambuteau, however, states that it is scarcely ever congenital; but it is not unlikely that experienced observers may predicate, from the appearance of the newly born infant, whether or not it is likely to become the subject of this dreadful infirmity — may observe that state of developement and formation, which, if not actually the incipient malady, is predisponent to its occurrence.

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CRISIS. — Syn. Κρίσις, a judgment or decision (from κρίνω, I judge or determine). *Judicium*, *Judicatio*, Lat. *Entscheidung der Krankheit*, Ger. *Crise*, Fr. *Crisi*, Ital.

Classif. — Prognosis.

1. Crisis may be defined *a sudden change during the height of a disease, tending either to recovery or to death.* Critical changes have been much regarded in the prognosis and treatment of diseases, from the time of Hippocrates, who first mentioned them, and the days on which they occur, down to the present period. Asclepiades, and the methodists, however, denied their influence, and disputed the existence of critical days. Galen and his followers attached great importance to them. It is recorded, that, having been called to a patient—a young man—with two disciples of Themison, Galen prognosticated a favourable change by a critical hæmorrhage. The opinion was ridiculed by the two methodists, who advised blood-letting; but it was soon verified, for the patient had a copious epistaxis, after which he recovered. It is unnecessary to allude to the writers who have contended for the importance of this subject: they comprise most of the eminent names in medicine, from Hippocrates to Cullen, Pinel, Frank, Hildenbrand, and Kreyssig. The titles of many hundred volumes that have been written upon it might be adduced in proof of the consideration attached to it: and although much more has been imputed to critical evacuations, and days, particularly by the humoral pathologists, than legitimately belongs to them, and granting that too devoted an attention to them has induced many to adopt injudicious indications, and weak measures of cure, yet some reputation will be acquired from the prognosis which an acquaintance with them will enable the physician to give; and much benefit will result to the patient from the treatment which this knowledge will suggest.

2. Since the overturn of the humoral pathology, the doctrine of critical evacuations has undeservedly fallen into disrepute, although the eminent writers who contributed most to the overthrow are amongst its most rational and warm espousers. In our own country, at the present time, too little attention is paid to these evacuations, and still less to the periods at which they occur. There can be no doubt that the former is the most important; but the latter part of the subject should not be disregarded. After all that has been urged in favour of, or in opposition to, the doctrine, I may conclude that, in temperate climates, a number of diseases, particularly fevers, run on for certain periods with regularity, and, after an exasperation of the symptoms, or some violent perturbation of the economy, terminate by evacuations of different kinds, which tend to remove the train of morbid actions, and to restore the healthy functions. In other cases, the exasperation of disorder is followed by imperfect evacuations, occurring in an irregular manner; whilst in some it gives rise to

additional phenomena of a dangerous or fatal character: hence crises have been denominated *salutary* and complete, *imperfect* and *fatal*. It was considered by the older writers requisite to a salutary crisis, that the evacuations constituting it should be attended by favourable symptoms, and be copious and manifest; and not only appropriate to the disease, but also consistent with the state of the patient. An imperfect crisis was considered *better* or *worse:* the better state alleviating the malady; the worse rendering it more severe and dangerous, from the supervention of metastases and complications. Having described the phenomena which are critical, I shall next notice the periods of disease at which they are most frequently observed.

3. I. CRISES manifest themselves,—1st. ON THE SKIN: *A.* by sweats; *B.* by acute or chronic eruptions. 2d. IN THE CELLULAR TISSUE: *A.* by swellings in various parts; *B.* by boils and carbuncles; *C.* by gangrene; and *D.* by purulent collections. 3d. IN THE GLANDS: *B.* by buboes; *B.* by swelling of the parotids; *C.* by salivation; *D.* by a flux of urine. 4th. ON THE MUCOUS SURFACES: *A.* by increased excretion — *a.* from the nose; *b.* from the bronchi, &c.; *c.* from the stomach (vomiting); *d.* from the bowels (diarrhœa); *B.* by sanguineous exhalation — *a.* by flux — α. the hæmorrhoidal; β. the menstrual; *b.* by hæmorrhagy; α. from the nose (epistaxis); β. from the bronchi (hæmoptysis); γ. from the stomach (hæmatemesis); δ. from the intestines; ε. from the uterus (menorrhagia); ζ. from the urinary organs (hæmaturia).

4. 1st. *A. Sweats* are salutary crises in continued and bilious fevers, in inflammations of the lungs and liver, in bronchitis, and less frequently in rheumatism. FRACASTORI describes an epidemic putrid fever which generally terminated favourably in this manner. Acute dropsy, particularly anasarca, when caused by interrupted perspiration, sometimes disappears after copious sweats. This evacuation is usually preceded and *indicated* by a soft, full, open pulse; by a diminution of the alvine evacuations; by softness, and occasionally slight itching, of the skin; and by increased colour of the cheeks. A salutary sweat should be distinguished from such as are limited to the forehead or face, and the neck or breast, whilst the rest of the body is dry; or those which cover only the lower extremeties: these constitute merely partial or incomplete crises, and merely diminish the violence of disease.

5. *B. Eruptions.*— Miliary and vesicular eruptions only are critical: the others are merely symptomatic, or even form a part of the disease; as erysipelas, purpura, petechiæ, &c. A miliary eruption is favourable, if the symptoms subside, if the patient feels an itching or pricking, if they be general, and do not appear before the seventh day: if they be unattended by fulness of the surface; and if their subsidence be followed by vomitings, hiccup, or convulsions, they indicate a fatal termination (LANDRÉ-BEAUVAIS). Sometimes a miliary eruption comes out at different periods, and prolongs the disease, when partial relief follows it, each appearance being an incomplete crisis. Many chronic eruptions may not only be complications of visceral disease, but occasionally imperfect crises,—they alleviating the internal malady. They are more rarely completely salutary.

6. 2d. *A. Swellings of various parts,* as of the face or neck, the hands, the lower extremities, &c., have been considered as partial crises in ataxic and gastric fevers, and in exanthematous diseases. *B. Boils* are critical in some complaints, particularly towards the termination of acute diseases, especially small-pox. *C. Gangrenous* pustules or *anthrax* occur in malignant or pestilential fevers; *gangrenous escars* also are met with in similar cases, as well as in typhoid or adynamic fevers, particularly about the sacrum, and in places which have been blistered, or pressed upon. If, in such cases, the febrile symptoms subside upon the sphacelation, and if the grangenous change be rapidly and distinctly circumscribed, it may be favourably critical; but if the symptoms continue, and the pulse becomes more frequent, weak, small, and soft, the local mischief is entirely symptomatic, and indicative of an unfavourable termination. *D. Purulent collections* are *indicated* by the continuance of the disease without any considerable evacuation, or exhaustion; by a sense of chill, horripilation or rigor, occurring at intervals, without any manifest cause; by the discharge of much clear urine; by partial sweats; by a softness of the pulse; by a remittent or hectic fever, and by flabbiness of the soft solids. The favourable changes of this nature occur in the extremities, and suppurate easily and rapidly. Those that are unfavourable take place in some internal viscus.

7. 3d. *A. Buboes* chiefly belong to pestilential fevers; but they are occasionally observed in the adynamic fevers of temperate climates. They indicate a favourable or fatal crisis in the manner stated with respect to gangrenous escars. *B. Swellings of the parotids* occur in low or malignant fevers; and appear either alone, or with other critical changes. They are commonly *preceded* by a slight rigor; by severe headach, stupor, noises in the ears, and deafness, with paleness, swelling, and sometimes redness of the countenance. This occurrence is rarely critical, and, of itself, furnishes no sure indication of the issue: if accompanied with favourable changes, it becomes an additional sign of returning health; but if the swelling is slow, or disappears in a very short time, the other symptoms still continuing, it is a dangerous circumstance. *C. Salivation* was noticed by SYDENHAM as a principal critical evacuation in the fevers of 1667 and 1668; and it occurred in the epidemic that prevailed at Breslaw in 1700. It occasionally supervenes in some forms of cynanche, and in bilious and gastric fevers. *D. The urine* is sometimes discharged copiously at the height of febrile and inflammatory diseases; and is to be viewed as a favourable occurrence. It is usually clear when recently evacuated, but deposits soon afterwards a whitish or rose-coloured sediment. The *symptoms* indicating this discharge are very obscure. Some authors have noticed the "*pulsus myurus*," which consists of every three or four successive pulsations being progressively diminished. A sense of weight below the hypochondria; of gravative tension in the hypogastrium, and of heat in the urinary organs, is stated by M. LANDRÉ-BEAUVAIS to precede this evacuation.

8. 4th. *A. a. Coryza,* or sero-mucous excretion from the nose, is sometimes critical in continued fevers; but little importance is to be attached to

it. *b. Mucous excretion* from the *bronchi* is frequently a partial crisis in several fevers, and in inflammations of the thoracic viscera (see BRONCHI and LUNGS). *c. Vomitings* are rarely indications of a perfect crisis; they occasionally, however, favour the developement of those changes which precede a favourable termination of disease. They are sometimes *ushered in* by a bitter taste in the mouth, yellowish fur on the tongue, suborbitar pain, and headach, nausea, salivation, coldness of the extremities; and frequency, and occasionally intermissions, of the pulse. *d. Diarrhœa* and copious alvine evacuations are favourable crises in nearly all acute, and even in some chronic diseases. But it is necessary that they should be fæculent or bilious, and homogeneous—not watery or flocculent: if they approach to a natural, or have a yellowish brown, colour, and are followed by abatement of fever, &c., a favourable crisis may be confidently looked for. The chronic diseases, in which they indicate a change tending to health, are congestions and inflammations of the liver and spleen, hypochondriasis and melancholy, slight or incipient dropsies, rheumatism, and gout. They are usually *preceded by* borborygmi, with slight flatulent distension of the abdomen; flatulence and eructation; a sense of tension and uneasiness in the lumbar region; flying pains in the extremities; and a developed but unequal pulse, occasionally with irregular intermissions.

9. *B. Sanguineous exhalations* are often critical in the more inflammatory states of fever, and in the phlegmasiæ. According to HOFFMANN and LANDRÉ-BEAUVAIS, discharges of blood from the nose, the hæmorrhoidal vessels, or the uterus, are equally salutary in ardent fevers. In general, these hæmorrhages are *preceded by* depression of the morbid temperature, and erethism of the skin; by slight horripilations of the limbs; by a more open and rebounding pulse; and a sense of heat, pruritus, and tickling, in the part whence the evacuation is about to proceed. *a.* The *menstrual flux* is sometimes a rapid crisis in fevers and phlegmasiæ. It is *indicated* by dull heavy pains in the loins, groins, and tops of the thighs; by tension in the hypogastrium; heat and pruritus of the genitals; pallor of the face, and a dark circle round the eyes; swelling of the breasts; pale, scanty urine; horripilation, and erethism of the skin; and by a quick, sharp, and unequal pulse. Very frequently the menses appear at the regular period, or a little earlier, or later, in fevers and inflammations, without affording any, or but imperfect relief. In these cases, they should not paralyse the activity of the treatment. When they occur at or before the usual time, are abundant, and are attended by evident benefit, they should be considered as critical: but if they are delayed, or are difficult or scanty, they are imperfect crises, and should not interfere with the measures which the circumstances of the case may require. *b.* The *hæmorrhoidal flux* is often critical in inflammatory fever, pneumonia, hepatitis, and other phlegmasiæ. STAHL states that a return of this discharge is sometimes favourable in inflammations of the brain, and particularly in hepatitis, nephritis, melancholia, hypochondriasis, and mania. The observation is certainly correct. This evacuation is *indicated* by pains in the loins and the groins; by a sense of uneasiness and pressure towards the anus and perineum; by frequent desire to pass the urine and go to stool; by flatulence and borborygmi, slight pallor of the face, and fulness of the hypochondria; and by fulness and inequality of the pulse as to strength. *c. Critical epistaxis* was considered of great importance by the older physicians, who paid much attention to the symptoms indicating its *accession*: these are, redness, with slight tumefaction of the face and eyes; reddish or brilliant objects floating before the eyes; the involuntary shedding of tears; weight of the temples, and beating of their arteries; deafness, or noises in the ears; slight delirium, or vertigo; a sense of tension in the neck, with distension of its veins; a dull pain in the forehead, and at the root of the nose, or an itching and tickling in the nostrils; a quick, hard, full, and an unequal pulse; frequent and slightly laborious respiration; sometimes with tension or oppression, without pain, at the præcordia. Occasionally, pallor, and constriction of the whole surface, coldness of the lower extremities, and horripilations, also *precede* a critical epistaxis. This crisis is most common in young persons, and adults whose vital energies have been previously unimpaired, and who have been subject to this evacuation. It occurs most frequently in summer and autumn; in the more inflammatory states of fever: in the acute phlegmasiæ affecting the super-diaphragmatic organs; and rarely in hepatitis. If the discharge consists of a few drops only, it is an alarming symptom; and although it be copious, if not soon followed by amendment, it is unfavourable. When excessive, and attended by syncope, convulsions, loss of power, partial or cold sweats, and cold extremities, it is a fatal sign. A syncope, however, which terminates the epistaxis, is often followed by recovery (LANDRÉ-BEAUVAIS).

10. *d. Hæmoptysis, hæmatemesis, hæmaturia, and intestinal hæmorrhagy,* are always false or unfavourable crises. They are generally *preceded* by tension and tenderness of the hypochondria; and supervene most frequently in adynamic, malignant, and pestilential fevers; in confluent smallpox, scarlatina maligna, and in scurvy: they occur less frequently in females than in males.

11. *A.* The above are the phenomena which have usually been considered critical by the older, and which are admitted by the best modern, medical writers; as well as the symptoms which indicate their accession. There are, however, still some circumstances connected with them deserving of notice. *a.* The *hæmorrhagic* evacuations occur most frequently in the spring, or in dry summers, in persons from 15 to 35 years of age, of a sanguine or irritable temperament, and in acute complaints. *b.* The *cutaneous evacuation* is most common in summer and autumn, in robust and fat persons upwards of 30 years of age, and in continued, remittent, and intermittent fevers. *c.* A *critical diarrhœa* is most frequent in autumn, in persons of a bilious temperament, and in remittent and intermittent fevers. *d. Discharges* of *urine* are observed in all ages, in all seasons, particularly winter and spring, and in all acute diseases.

12. *B.* Critical evacuations are — *a. rare,* in persons enfeebled by age, or by some other antecedent disease; in very moist and very cold, or very hot climates; during remarkably sudden and great vicissitudes of weather; and especially

when the vital energies are much reduced by a lowering and an evacuating treatment. *b.* They are not always similar in the same diseases; and they *vary* in respect of the nature of the discharges, and of the periods at which they take place, as well as of the organs by which they are produced. A favourable change in gastric, bilious, and adynamic fevers, is often attended by alvine discharges of a homogeneous, fluid, yellowish, yellowish brown, or brownish black appearance,—in inflammatory fevers, in young men, by epistaxis, often occurring on the seventh day,—in these diseases, in young women, by a copious flow of the catamenia taking place on the same day,—and in men of middle age, by sweats, or by some other discharges coming on the fourteenth, or at a subsequent period. Catarrhal and bronchial complaints terminate with expectoration, or with sweats, or a copious flow of urine, &c.

13. *C.* The *duration* of critical evacuations is very uncertain. The hæmorrhagic, the alvine, and the urinary, seldom continue longer than twelve or twenty-four hours, sometimes even much less. Sweats and expectoration are occasionally of no longer duration; but, in the majority of instances, these two evacuations are prolonged several days before the disease is entirely subdued. Purulent collections and gangrene may take place in a few hours, but they generally require a much longer period.

14. *D.* Critical discharges cannot be *changed* or *determined* in their route or period of eruption, by art; and when they supervene, they cannot be safely interfered with, unless they threaten life by their excess. If they be interupted by accident, or by an injudicious and meddling practice, they are followed by unfavourable metastases and complications, or sequelæ, sometimes terminating in organic change, and death. Thus, when the perspirations which occur upon the change in fevers, and some of the exanthemata, are interrupted, effusion often takes place from serous surfaces, or into the cellular tissue. The most active vascular depletions can never compensate for the suppression of an abundant menstrual or hæmorrhoidal flux, occurring at the acmé of acute diseases;—the effects of art are here unequal to those produced by nature. Hence the advantage of recognising critical evacuations, even although we may not otherwise confide in them. Although it is thus important to attend to them in our prognosis, and especially in the treatment, when signs of their accession appear, or when they are actually present, yet the expectation of their occurrence ought never to interfere with or prevent the adoption of judicious intentions and means of cure. Even granting, with Hahnemann, that they are not to be imitated by art, still they furnish several useful indications. "*Quo natura vergit, eo ducendum est,*" may occasionally be adopted, after a careful consideration of the changes of which they are the effects, but not the causes. Much mischief has accrued from considering critical evacuations as the causes, and not as the consequences, of changes that take place in the economy at the acmé of acute diseases. Reil has touched upon this fallacy, but has not considered the nature of the changes of which critical evacuations are the effects, or attempted to explain the manner of their accession.

15. II. Causes, &c.—*A.* We have seen that crises take place chiefly from eliminating or excreting surfaces and organs; and that they consist of a copious irruption of either previously suppressed secretions and excretions, or an accustomed sanguineous evacuation; but the causes which occasion, and the changes which precede them, are not so readily recognised. When we consider of what they consist, especially in relation to the fact of their occurrence only in maladies characterised in their earlier stages by interrupted secretion and excretion, and by morbid excitement of the vascular system—the vascular excitement being perpetuated and variously modified by suspension of the visceral functions now mentioned, or by local irritation, or by both—we shall arrive at a tolerably accurate inference respecting the causes of crises, and the importance that ought to be attached to them. There are few facts in pathology better established than that vascular excitement, when it reaches a certain height, or assumes an inflammatory form, impedes, interrupts, or even arrests, the natural functions of secreting or glandular organs; whilst a lower grade of excitement, unattended by inflammation, generally increases the functions of the organ thus affected. Therefore, when excitement continues to be expressed chiefly in the vascular system generally, secretion and excretion continue impeded or entirely suspended; and the effete materials, which, under other circumstances, are continually being removed from the circulation, accumulate in it, perpetuating and modifying the vascular excitement until it becomes exhausted, and until the accumulated noxious materials in the blood irritate the viscera destined to remove them, and thus incline the balance of excitement from the general vascular system to eliminating organs. Hence the occurrence of critical evacuations at the acmé of acute diseases; and hence their importance as indications of change in the states,—1st, of vital power; 2d, of vascular action; 3d, of the circulating fluid; and, 4th, of the functions of secreting and excreting viscera. As crises have been neglected or confided in according as they agreed with the doctrines of the day, and have, in modern times, shared the fate of the pathology on which they had been so long grafted, I shall attempt to illustrate this view by a reference to one of the very common circumstances in which they are observed. A person exposed to the causes of autumnal fever of a bilious and remittent form, experiences during the earlier stages the usual symptoms of impeded or interrupted secretion and general vascular excitement, with evening exacerbations. In consequence of interrupted action of the emunctories, the blood contains an increasing proportion of effete materials, particularly of the elements out of which bile is formed. These for a while increase and modify the vascular excitement, or, when excessive in quantity, or especially noxious in quality, even tend to exhaust or depress it; but they, at the same time, being appropriate stimuli to the biliary and depuratory viscera, serve to restore their impeded functions, to turn the balance of excitement in favour of them,—thereby to reduce the morbid vascular action, to cleanse the circulating fluid from its impurities, and to change in other respects its condition; and thus the disease terminates with an apparent collapse,

followed by a copious discharge from the bowels, consisting of morbid bile, and of the excretions from the intestinal mucous surface — the products of the noxious matters which had accumulated in the blood, but which is now being eliminated from it by a renovated, as well as an increased, secreting and excreting function. Now, this procession of morbid phenomena is consistent with what I have repeatedly observed in both temperate and warm climates; and shows that the ancients were not so far wrong as many of the moderns suppose, when they believed that critical evacuations were beneficial chiefly because they conveyed a morbid matter out of the system; and therefore could never be perfectly compensated for, or imitated by, art.

16. But it may be objected, that this explanation is based entirely upon the opinion that the circulating fluid becomes altered, owing to interruption of the various secreting and excreting functions; and that it cannot obtain in those cases wherein no such interruption appears to occur. In this case, it is very probable that critical changes are effected in a great measure by the vital influence of the frame. Even according to the foregoing view of the subject, the agency of the vital endowment must not be left entirely out of consideration; for, without its reaction, through the instrumentality of the different internal organs with which it is associated, upon the morbid matters affecting it, those matters could not be separated from the circulation and expelled from the system. It seems, therefore, more than probable that crises consist, in the majority of cases, of more than the simple excretion of the accumulated effete matters from the circulation — such excretion being merely the effects of an anterior and still more important and more constant change. The attentive observer of the phenomena successively occurring during the progress of disease must have sometimes remarked, in those maladies especially, wherein the vital manifestations are particularly implicated, certain perturbations or struggles occurring at their acmé, either followed by recovery, but without any very manifest evacuation — at least to the extent of explaining the circumstance; or passing into exhaustion and death, sometimes without any organic change to account for the issue. In such cases, we can merely infer, that the vital endowment of the frame resists or opposes changes in the state of the structures with which it is associated; that it does so successfully in the former, and unavailingly in the latter, of these cases; and that, unless its energies are overwhelmed by very powerful and noxious causes, as occasionally is observed, it thereby tends to prevent the dissolution of this association to which such changes might directly or indirectly lead. This vital manifestation — whether denominated the "*vis medicatrix naturæ*," or vital resistence, or vital reaction, &c. — most certainly obtains in a very large proportion of diseases, and is instrumental in the developement of those changes, which immediately or mediately conduce to recovery, and which, in the more extreme cases, are attended by various phenomena indicating the vacillating predominancy of vital and functional power, or of organic disease; the acquired ascendency of either over the other occasioning, as the case may be, a favourable or an unfavourable crises. That such a struggle for the ascendency should manifest itself favourably at certain periods, or on determinate days, in preference to others, can be explained only by considering it a law of the living economy identical with, or related to, the periodicity of vital action observed in the healthy, and still more apparently in the diseased functions.

17. *B.* Numerous illustrations of the following propositions might be adduced, in addition to that now advanced: — *a.* Evacuations occurring at the height of acute diseases are often among the first indications of, and are, indeed, occasioned by, the subsidence of local or general vascular excitement. *b.* In many febrile diseases, crises are brought about by the excretion — under the influence of vital reaction or resistance of the secreting viscera — of the effete matters accumulated in the blood, or upon internal organs and surfaces, owing to interrupted excreting function, as shown above. *c.* When a crisis is attended by apparent collapse or change of action, this may arise either from the vital reaction of internal secreting organs occasioning a derivation from the periphery to the more central parts of the frame, or, from the previous exhaustion or subsidence of the vascular excitement allowing the secreting and excreting organs to resume their functions when excited by their appropriate stimuli in the accumulated elements of their respective secretions. *d.* When crises consist of sanguineous fluxes or discharges, they are occasioned, in great measure, by the vascular plethora consequent upon impeded secretion, together with local determination to, or congestion of, such mucous surfaces or organs as are most disposed, by original conformation, previous disease, or established function, to these changes. *e.* That a favourable crisis may manifest itself in one organ or function, or in two or more, either simultaneously or successively, as by sweats, or by alvine or urinary discharges, or by expectoration, &c. *f.* When, during the progress of disease, the aqueous and albuminous elements of the blood become excessive, or when noxious matters accumulate, and are not eliminated in the form of crises as above stated, or by medical aid, they may so affect the capillaries in the parenchyma of the organs, or in serous surfaces, as to give rise to various organic changes and effusions. These may be viewed as *unfavourable* crises, determined to vital organs and internal cavities, arising from deficient vital energy, or vital resistance and reaction, or predisposition, or constitutional vice of some organ or part; each of which may obtain either alone, or with local or general plethora produced by interrupted secretion, &c.

18. *C.* Critical terminations are observed most frequently in the more inflammatory, the bilious, the gastric, and the intestinal forms of fever; in the different phlegmasiæ, in some hæmorrhagic diseases, and more rarely in chronic maladies. They are more commonly remarked in some epidemics than in others; and are seldom apparent, as justly remarked by LENTIN, in putrid or malignant diseases, and, I may add, in the pestilential fevers of warm climates. In these, the depressing and contaminating influences of their causes, and of the states of the secretions upon the nervous energy, on the circulation, and subsequently upon the soft solids, so far subdue the vital influence as to render its resistance unavail-

ing in the morbid strife; and it becomes insufficient to separate and throw off the polluting matters, which ultimately increase so as altogether to overpower it. The chronic maladies in which crises are sometimes met with are — mania, hypochondriasis, melancholy, and idiopathic dropsies. But there are numerous circumstances which prevent their occurrence in the above diseases. In this country they are more rarely observed than they would otherwise be, if the treatment of the diseases in which they commonly occur were left more to nature.

19. *D.* Amongst the most frequent *causes that prevent the developement of crises*, particularly such as are favourable, may be enumerated — old age; the lymphatic temperament, and leucophlegmatic habit of body; previous disease, and disposition of structures or organs to organic change. Constitutional or local vice; the scrofulous, gouty, or rheumatic diathesis; exhausted vital power; inanition or general cachexy, particularly from innutritious or unwholesome food; and a too lowering or depletory mode of treatment relatively to the constitution and circumstances of the patient, not only obstruct the developement of regular or favourable crises, but render them imperfect or unfavourable. The large depletions, and the copious and repeated alvine evacuations, very generally resorted to in the early stages of acute diseases, even although they may frequently ward off a fatal issue, often manifestly prevent the accession of regular crises, —1st, by debilitating the patient, and thereby rendering the vital resistance insufficient for their full evolution; and, 2d, from the circumstance of these means of cure being substituted or artificial evacuations or crises, and preventing by anticipation and substitution those which are natural.

20. And here a most important question suggests itself, viz. *Whether or not it is better thus to substitute artificial, for the mere chance of the accession of natural evacuations?* As respects the phlegmasiæ, and many diseases, — particularly those, on the one hand, in which vascular action is excessive, and those, on the other, in which it is insufficient, and the vital powers are greatly depressed, — there can be no doubt of the propriety of resorting to artificial means to preserve an organ from the disorganising tendency of excessive action, and to raise the prostrate powers of life. Besides, it is excessive, and not moderate and judicious measures, which obstruct the evolution of favourable crises: the latter are even requisite aids to nature, in bringing about salutary changes, and a felicitous termination of disease. In respect, however, of many forms of fever, I believe that the *nimia diligentia* of the practitioner is as often injurious as it is beneficial, and that it disturbs those changes which can be effected only by time, and sometimes disposes to metastasis, complications, and unfavourable crises, by depressing the vital energies, and checking salutary changes at the early periods of their evolution, and before they become fully manifested. This fact was established by HILDENBRAND in respect of the typhoid and adynamic fevers which were epidemic through Germany from 1810 to 1816. He observed, that a much greater number of cases recovered when left in a great measure to nature, the physician interfering no further than to preserve vital organs from dangerous congestions, than when a *medicina perturbatrix* was adopted.

21. III. The CRITICAL DAYS (*Dies indicatorii*) are those on which favourable changes usually occur. They are either *simply* or *especially* critical. The third, fifth, *seventh*, ninth, eleventh, *fourteenth*, seventeenth, *twentieth*, *twenty-seventh*, thirty-fourth, and fortieth, are critical days; the seventh, fourteenth, twentieth, and twenty-seventh being those which are especially critical. GALEN, and some other writers, mention the fortieth, sixtieth, eightieth, hundredth, and hundred and twentieth; but these are more doubtful, and can apply only to chronic diseases. The third, fifth, ninth, and, by some writers, the eleventh, and seventeenth, are often called *intercalary* days: on these, crises less frequently occur. The intervening days are *non-critical* or vacant, on which salutary changes very seldom take place. FORESTUS, DE HAEN, BORDEU, and various other authors, have entered upon calculations respecting the terminations of acute diseases on particular days; and it results therefrom, that about three fourths have observed regular periods. These periods are, however, not always the same in similar diseases. They vary with the age, the constitutional powers, the temperament, and the regimen of the patients. They are earlier, and much more uniformly observed, in robust persons, than in those who are weak and advanced in age.

22. That critical changes should so frequently occur on the days specified, cannot be explained otherwise than in the way attempted by CULLEN. He remarks that, from the universality of the tertian and quartan periods in agues, we cannot doubt of there being in the animal economy a tendency to observe such periods; and the critical days above mentioned are consistent with this tendency, as all of them mark either tertian or quartan periods. These periods are, however, not promiscuously mixed, but occupy constantly their several portions in the progress of the disease; so that, from the beginning to the eleventh day, a tertian period obtains; and from the eleventh to the twentieth, and, perhaps, longer, a quartan period is as steadily observed.

23. In entering thus fully into the exposition of the doctrine of crises, according to my belief, as deduced from observation, and the recorded experience of the best authors, I would recommend a judicious, but not a too partial, attention to them, excepting in fevers where morbid action has so far advanced that a determinate course must be reckoned upon; but, when any vital organ is threatened by disease, either originating in it, or attacking it consecutively, as in the progress of fevers and of the exanthemata, or when the vital powers are greatly reduced, although favourable crises may occur, they cannot be reckoned upon, and the expectation of them ought not then to prevent the adoption of decisive measures. When, however, they do supervene under such circumstances, the knowledge of the facts connected with them becomes of real importance, inasmuch as it acquaints us that the means of cure ought to be directed in such a way as not to impede or interrupt, but to develope and promote them. Their occurrence on certain days, in preference to others, should also induce us to watch the phenomena of disease at these periods with the utmost attention. It is true

that critical days have been denied by many of the moderns, upon the ground of their not having observed them. But, as Dr. Cullen has well remarked, the fault is in the physician. He who will not observe closely and comprehensively, should not throw discredit on the results obtained by the more accurate and attentive enquirer. Authorities in matters of opinion are of little value; but in matters of fact, as in this case, they are testimonies — are positive evidences; and whoever will take the trouble to refer to several hundred authorities collected by Ploucquet, or even to those below (nearly all of which he has omitted), will find them sufficiently conclusive.

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CROUP. — Syn. *Affectio Orthopnoica*, Baillou. *Angina Strepitosa*, Ghisi. *Angina Infantum*, Wilcke. *Cynanche Stridula*, Wahlbom. *Angina Suffocatoria*, Bard. *Angina Infantum Strangulatoria*, Russel. *Cynanche, vel Angina Trachealis*, Cullen, Johnston, Rush, &c. *Asthma Infantum Spasmodicum*, Simpson. *Suffocatio Stridula*, Home. *Asthma Acutum Infantum*, Millar and Cookson. *Morbus Strangulatorius*, Starr and Rosen. *Morbus Truculentus Infantum*, Van Bergen. *Angina Polyposa*, Michaelis. *Angina Membranacea*, Auct. Var. *Cynanche Laryngea*, Dick. *Orthopnœa Membranacea*, Laudun. *Tracheitis Infantum*, Albers et Frank. *Angina Laryngea Exudatoria*, Hufeland. *Laryngo-Trachéite*, Blaud. *Empresma Bronchlemmitis*, Good. *Cauma Bronchitis*, Young. *Die Häutige Bräune*, *Huhnerhüsten*, Germ. *Trachéite, Croup*, Fr. *Strypsiucka*, Swed. *Croup*, or *Roup*, Scott. *Hives*, Amer.

Classif. — 1. *Class*, Febrile Diseases; 2. Diseases of Sanguineous Function; 2. *Order*, Inflammations (*Cullen*). 3. *Class*, *Order*, Inflammations (*Good*). III. Class, I. Order (*Author*, in *Preface*).

1. Nosolog. Defin. — *Accelerated, difficult, wheezing, or shrill respiration; short, dry, constant, clangous or barking cough; hoarse or altered voice; pain and constriction above the sternum, with symptomatic inflammatory fever; frequently, towards the close of the disease, expectoration of membranous, albuminous, or glutinous substances, occurring in children.*

2. Patholog. Defin. — *Inflammation of the trachea, sometimes of the larynx and trachea, and frequently also extending to the large bronchi, occasioning albuminous and membranous exudation, more or less spasm of those parts; and terminating either in suffocatiou or exhaustion of vital power, generally in a few days, or within the period constituting an acute malady.*

3. Lit. Hist. — Although we had no precise account of croup until the work of Home appeared, yet there cannot be any doubt of its occasional occurrence among children from the earliest ages; and that it was confounded with other diseases affecting the throat and air-passages. Hippocrates states, "Angina Gravissima quidem est, et celerrimè interimit, quæ neque in faucibus neque in cervice quicquam conspicuum facit, plurimum verò dolorem exhibet, et difficultatem spirandi, quæ erectâ cervice obitur, inducit. Hæc enim eodem etiam die, et secundo, et tertio, et quarto strangulat." And Baillou, after describing an affection of the respiratory passages, observed in Paris, in 1576, with the nature of which he was unacquainted, remarks, "Chirurgus affirmavit se secuisse cadaver pueri ista difficili respiratione et morbo (ut dixi) incognito sublati: inventa est pituita lenta, contumax, quæ instar membranæ cujusdam arteria aspera erat obtenta, ut non esset liber exitus et introitus spiritui externo: sic suffocatio repentina." That the above observations strictly apply to croup, there can be no doubt. Dr. Blair, of Cupar Angus, first mentioned, and shortly described, the disease by its present name, in his medical papers published in 1718. Ghisi noticed it, as it prevailed in the north of Italy in 1747, by the appellation of *Angina Strepitosa*; Starr, in the *Philosophical Transactions* for 1749 and 1750, by the name of *Morbus Strangulatorius*; and Wilcke, as it occurred in Sweden during some years preceding 1764. After the descriptions furnished by Home, and his Swedish contemporaries, Halen and Wahlbom, it received a place among specific diseases, and became the subject of a number of works, and even of controversial discussion. The treatises of Simpson, in 1761, and of Millar, in 1769, on the acute asthma of infants, gave rise to this latter occurrence, especially on the Continent. These authors, having observed the more spasmodic states of this disease, described them under the above designation; subsequent writers differing widely as to their being distinct maladies, or merely varieties of inflammatory croup, with predominance of the spasmodic symptoms. This point was warmly contested in the numerous productions which the prize offered by Napoleon, in 1807, called forth. My opinions respecting it will appear in the sequel.

4. I. History of the Forms and Progress of the Disease. — Croup has been viewed, since its description by Home, as an inflammation of the interior surface of the trachea and larynx. Some authors have divided it into *three* distinct varieties, namely, 1st, *Catarrhal* croup, or a slighter

form of the disease; 2d, *Nervous* or *Spasmodic* croup, or a slighter state of the inflammation, occurring in nervous and irritable temperaments, which influence the form and issue of the disease, giving rise to a spasmodic form of it; and 3d, *Inflammatory* croup, or that in which the inflammation of the air passages is carried to a greater height, and is always attended by the production of a membranous exudation. The opinion that croup consists of an acute inflammation, occasioning the production, in a number of cases, of a false membrane; in others, of an albuminous concretion of various degrees of density; in some, of a viscid mucous secretion, and of the inflammatory lesions of the mucous membrane itself, already described (see Bronchi, &c. §3, 55.); has been attacked by MM. Guersent and Bretonneau, who consider that the formation of a false membrane is the distinctive character of croup; and that those cases in which it is not formed, are merely what they term *false* croup. I agree with M. Bricheteau in considering that the distinction here contended for is calculated more to puzzle the inexperienced, than to advance our knowledge. The experiments of Schwilgue, Jurine, Albers, Schmidt, and Chaussier, as well as pathological observation, prove that the form of disease called false croup by the above authors proceeds from a similar state of morbid action as that denominated the pure disease, and is merely a modification resulting from less intensity of the inflammation, peculiarity of the temperament and habit of body, the causes occasioning it, and the greater predominance of the spasmodic or nervous states. The experiments of the authors now referred to demonstrate, that the injection of irritating matters into the air-passages sometimes produces simple inflammatory irritation; in others, a thick, viscid, mucous exudation; and in many, particularly in young animals, a complete false membrane. These differences of opinion, which are not confined to the writers now mentioned, but extend to many of those quoted in the course of the article, will appear, from what is about to be advanced, as more apparent than real. That the disease should present numerous modifications, approaching acute bronchitis on the one hand, and identical with laryngitis on the other, and varying characters according to the portion of the air-passages chiefly affected, the temperament, habit of body, severity of inflammatory action, and association with other diseases, is an inference to which *à priori* reasoning may lead every practitioner. Without adopting the confined views of some writers, or the hypothetical doctrines of others, I shall be guided chiefly by an extensive experience in the disease, and consider it under the following heads:—1st, The symptoms and progress of true croup; 2d, The varieties or modifications of the disease most frequently observed; and, 3d, The complicated and consecutive forms.

5. i. The usual Form and Progress of true Croup. — The *simple* and usual form of croup generally commences with more or less of precursory symptoms, and runs its course in a few days. It has been divided by authors into different stages or periods, more, — I believe, with the view of giving precision to their description, and to the treatment recommended, than from any marked change in the character of the symptoms. M. Goelis has divided it into four stages, viz. 1st, the invading or catarrhal stage; 2d, the inflammatory period; 3d, the stage of the albuminous exudation; and 4th, the period of imminent suffocation. A nearly similar division has also been adopted by Dr. Cheyne. The difficulty of determining these various stages must be evident; and yet the advantages arising from a division of the disease into distinct periods must be evident, — not so much, however, for the purpose of description, as for the more strict appropriation of the means of cure. Premising, therefore, that croup, particularly this form of it, is strictly progressive, with no great change in its features, until towards its close; and that, therefore, all divisions of its course are merely arbitrary, and without any positive grounds in nature; I shall notice, 1st, its *precursory* signs; 2d, its *developed* and confirmed state; and 3d, the state of *collapse* and imminent suffocation.

6. *A.* The *precursory period*, *period of invasion* (Guersent), *of irritation* (Royer-Collard), *catarrhal* stage (Goelis), *febrile* period (Duges). These precursory signs are sometimes well marked, and of a distinctly catarrhal nature, as observed by Goelis: occasionally they are slight, chiefly of a febrile description; and either from this circumstance, or from the shortness of their duration, attract but little notice. The febrile symptoms, when present, consist chiefly of alternating chilliness and heat, or, in the more acute cases, of slight chills, followed by heat of skin, frequency and hardness of pulse, slightly flushed countenance, want of appetite, headach, excited or variable spirits, alternating with sadness, lassitude, &c. Often, in place of these, or in addition to them, there are a short cough, hoarseness, sneezing, coryza, sometimes moroseness, and all the signs of common catarrh. Upon examining the pharynx and mouth, no trace of inflammation can be detected in this form of the disease; but the tongue is generally white, and loaded at its base. The eyes are watery, red; and the eyelids darker than usual. These symptoms are sometimes only of a few hours' duration, or they may be present for two or even three days. In very young children, they may be so slight as to escape detection, whilst a somewhat different train of phenomena, such as heat of skin, chilliness alternating with heat, frequent short fits of coughing during the night, want of sleep, restlessness, indications of uneasiness about the throat, furnished by the frequent application of the child's hand to this part, &c. manifest themselves. The importance of ascertaining the invasion of the disease have led several writers to pay much attention to its precursory symptoms. Vieusseux has attached much importance to the catarrhal signs, and change in the voice. But these are not by any means constant; and, even when present, may be merely the commencement of a slight catarrh; indeed, there is no symptom which can be relied upon, as indicating its approach, until the disease is nearly fully formed.

7. *B.* The *developed state of the disease* (the *Inflammatory*, of Cheyne and Hosack). — After the above symptoms have existed for a longer or shorter time, or in a more or less marked manner, hoarseness, if it have not previously existed;

sometimes a peculiar shrillness or puling of the voice; difficult, sibilous, sonorous respiration; and an unusual, dry, loud, clangous or ringing cough, as if passing through a brass tube, or sometimes resembling the barking of a puppy; are observed. This croupal cough scarcely admits of description, although it is readily recognised after having been once heard. The succussions constituting it are followed by a dry, hissing, slow, sonorous inspiration, resembling the sound produced by a piston forced through a dry pump, or by a crowing noise similar to that emitted by a chicken in the pip. Expiration between the cough is more easy than inspiration, but with precipitation; the pulse is frequent and hard; the skin hot or burning; the face flushed, sometimes covered with perspiration; the eyes are watery and prominent; the carotid arteries beat strongly, and the jugular veins are tumid. The head is now generally thrown backwards; and the child, either by its speech or attitudes, expresses a feeling of anxiety, with pain and constriction about the trachea and larynx, which are often slightly tumified externally. The above symptoms, which usually first appear during the evening or night, generally somewhat subside early in the morning, excepting the frequency of the pulse, the hoarseness of the voice, peculiarity of the cough, and the sibilous inspiration. This remission sometimes continues the greater part of the day; but after falling asleep, or towards evening, all the symptoms become more severe than ever; and the difficulty of respiration, the sense of suffocation, the anxiety and distress, are increased. The patient constantly applies the hand to the throat, which is sometimes painful to the touch; the countenance is bloated; the pulse still remains frequent, hard or small; the cough is short, precipitous, convulsive, ringing, and followed by a crowing, or shrill or hissing inspiration; and at the commencement of this stage is generally dry, or attended by a scanty mucous or sanguineous expectoration; subsequently it becomes husky and suffocative, sometimes with fruitless attempts to excrete what is felt in the trachea. The patient constantly changes his position; breathes with great difficulty, all the respiratory muscles acting with great force; and at each inspiration, the tumid larynx descends rapidly towards the sternum, whilst the epigastrium is drawn upwards and inwards; and, during expiration, the former is carried towards the maxilla, and the latter comes on a plane with the surrounding surface. If any remission at all occur now, it is much less evident. All the symptoms become more severe. The cough is now more difficult, suppressed, or strangulating; the suffocation accompanying it more imminent, and the stridor or hissing noise of inspiration following it much louder: sometimes it is followed by vomiting, and the excretion of a glairy mucus, occasionally containing flocculent or membranous shreds. The pulse is now very frequent, contracted, sharp, and small. The cheeks and lips are, particularly during the cough, somewhat livid, or extremely pale and tumid. There are also great irritability and somnolency, but no delirium. The hissing, sonorous, and croupy character of the inspiration increases; and the voice, which was shrill or hoarse, often becomes broken, whispering, suppressed, or puling. When vomiting follows the cough, and particularly when the excretion of glairy, albuminous, and membranous matters accompany it, a momentary relief is obtained, sometimes followed by progressive diminution of all the urgent symptoms. Deglutition, particularly of fluids, is sometimes difficult, especially when the larynx is affected, and induces the fits of cough and strangulation. These symptoms seldom continue equally intense during the whole of this stage, but present several slight remissions, particularly at its commencement, and in the less severe cases. Throughout this period, and, indeed, during the whole disease, the bowels are constipated, and the urine in small quantity, of a high colour, and generally albuminous. The *stethoscope* generally furnishes no further information in this stage than a louder sound than that already heard; unless when the disease extends to the large bronchi; when a dry, tubular, or bronchial respiration, unaccompanied with crepitous dilatation of the pulmonary cells, but attended with perfect resonance of the thorax, may be detected.

8. *C.* The *third stage*, or that of *collapse* and *threatened suffocation* (the *Suppurative*, of Hosack and Cheyne), may commence from the first to the seventh day from the invasion, according to the intensity of the disease, and constitution of the patient. This period is characterised chiefly by the absence of any remission, and the increased severity of all the symptoms, particularly the acceleration and diminished power of the pulse and respiration. The pulse is now small, weak, irregular, unequal, or even intermittent; the cough is less frequent, less audible, suppressed, but suffocative. The voice is whispering, low, or entirely abolished; and the speech quick, imperfect, or lost; the motions of the *alæ nasi* and the parietes of the chest are forcible and remarkable, and accompanied with a similar descent and ascent of the larynx and epigastrium to that already described (§ 7.). The head is constantly thrown back; perspiration flows from the forehead; the eyes become sunk, and lose their animation; the countenance often assumes a leaden hue; the tongue is dark and loaded, and its edges and the lips are purplish; the surface of the body is covered with a cold viscid perspiration; the feet and hands swell; the skin is extremely pallid, and shows the veins through it, particularly those of the neck, which are large and distended; and the stools are dark and offensive. The patient very seldom recovers from this state; but he sometimes obtains momentary, much more rarely permanent, relief, owing to the expectoration of a portion of the albuminous, membranous, and muco-puriform matters obstructing the larynx and trachea. When the excretion is free, recovery sometimes takes place slowly; but where it is scanty, or when the disease has extended downwards through the bronchi, as it usually does when thus severe, the issue is commonly fatal. In this case, the patient tosses about in great distress; he seizes on objects around him, and grasps them convulsively for a moment; he throws his head back; seizes his throat as if to remove an obstacle to respiration; makes forcible efforts to expand the lungs; and after a longer or shorter period of such distress, seldom above twenty hours, expires, sometimes with signs of convulsive suffocation, but as frequently with

continued increase of the foregoing symptoms, and evidence of exhaustion of the vital energies, and in a state of lethargy. The *stethoscope* generally furnishes information in this period of the extension of disease to the larger bronchi. This extreme state of disease seldom lasts longer than twenty-four hours. In young children, convulsions sometimes occur, and occasionally terminate life.

9. *D.* Such is the usual course of the *more severe* cases of common and uncomplicated croup, when left to nature, or unmitigated by treatment. In its *slighter grades*, hoarseness, with a hard ringing cough, followed by a crowing or stridulous inspiration, present chiefly in the night and remitting in the day, are almost the only symptoms; the respiration and pulse being but little disordered in the intervals, and the febrile symptoms not very acute. But even these very favourable cases may experience sudden and dangerous aggravations; whilst, on the other hand, the severe and acute disease now described may be soon ameliorated by early and decided treatment at its commencement, or by the discharge of tubular, membranous, or puriform matters, at its more advanced periods.

10. *E.* The *duration* of the disease depends upon the vital energies of the frame, and varies from two to eight or nine days; but I have seen it terminate somewhat earlier, and prolonged much later when partial or scanty expectoration takes place from time to time. A fatal issue is most common on the fourth day. I believe that it very rarely assumes a *chronic* state, preserving at the same time its essential characters; although a somewhat different opinion has been advanced by Goelis. The cases, however, which he has adduced as instances of the chronic disease, are evidently either the partial removal of the more inflammatory, with recurrence of the more spasmodic, symptoms; or slighter relapses; or the extension of the inflammatory action to the larger bronchi, and its continuance in this seat for a longer period. Albers admits that it may become chronic, and supposes that the false membrane may sometimes adhere to the inflamed surface, and be gradually absorbed; recovery at last taking place, without the excretion of the albuminous substances in such cases. These occurrences, although not impossible, are at least very rare. Hildenbrand supposes, on the other hand, that it may become chronic after the excretion of the albuminous exudation; inflammatory irritation still persisting in a lower grade, and terminating at last in ulceration. This is a much more probable occurrence; and I believe that I have met with it on two or three occasions, but I have never been able to verify it by dissection. In such cases, the disease continues in a slighter grade for several weeks, and is characterised by frequent remissions and exacerbations, emaciation, muco-purulent expectoration, slight soreness in the trachea, and the usual symptoms of tracheal consumption; the patient sometimes sinking at last, or occasionally recovering by judicious means.

11. ii. The Modifications of Croup. — The forms which the simple or uncomplicated disease assumes are attributable, as already hinted, to the particular part of the air-passages chiefly affected, to the temperament and habit of body of the patient, and the intensity of the causes.

12. 1st. *Croup with predominance of the acutely inflammatory symptoms* (the *Acutely Inflammatory Croup* of several modern authors). — This is merely the more acute or severe form of the disease, occurring in robust plethoric children of the sanguine temperament, who have been for some time weaned, and have had their first teeth, and during cold and dry states of the air. It is commonly preceded by chills, and horripilations, and in older children by distinct rigors; and is characterised by the more continued and unremitting severity of the symptoms, by the strength of the pulse, heat of skin, great difficulty and force of respiration, the vascular injection of the cheeks and lips, the highly inflammatory appearances of blood taken from a vein, &c. (*a.*) When the inflammation chiefly, or even partly, *implicates the larynx* (the *Laryngeal Croup* of Guersent and others), the strangulation, cough, and all the symptoms connected with respiration, voice, and speech, are extremely severe; pain is felt in the larynx and upper part of the trachea, and there is sometimes slight swelling in this situation. In young children convulsions, and in older children delirium, occasionally occur towards the close. The disease terminates in from twelve hours to five or six days, but most commonly in two or three days. (*b.*) When the inflammation is *confined to the trachea* (the *Tracheal Croup* of several Continental writers), the cough is at first dry, shrill, or sonorous, as if passing through a brass tube, and accompanied with sharp and lacerating pain in the course of the trachea, sometimes with slight tumefaction. The patient speaks in an under tone, but there is little hoarseness, and the voice and speech are not lost, or at least not so much affected as when the disease is seated partly or chiefly in the larynx. Heat of skin, and the usual symptoms of severe inflammatory fever, are also present. As the disease advances, the cough becomes more frequent and severe, but without the distressing sense of suffocation attending the foregoing modification; nevertheless there is still much difficulty of respiration in the intervals between the cough, sometimes with a species of rattle similar to that of bronchitis. The fits of cough are often followed by vomiting, or the rejection of membranous shreds, with a thick, glairy, and sometimes sanguinolent or purulent mucus. The excretion of this substance generally is productive of much relief, which is increased after each discharge, unless the inflammation has extended down the ramifications of the bronchi; and then the respiration continues extremely difficult, and the disease assumes all the characters of an acute bronchitis, and frequently terminates unfavourably. The progress of cases of this description is usually not so rapid, nor the termination so fatal, as of those affecting the larynx chiefly. All the symptoms evince less severity, especially when treated early; and it sometimes continues twelve or fifteen days, but usually from five to nine. When its severity merely is subdued, the inflammatory action not being altogether removed; or when, from accidental causes, or the fault of the constitution, it passes down the bronchi; it may be much more prolonged, and approach the chronic character; but it will then present many of the features of the most severe

bronchitis, into which, indeed, it will thus pass; and, as was stated in respect of that disease, whilst bronchitis may be followed by croup, the latter malady may thus occasion the former.

13. 2d. *Croup with predominance of bronchial symptoms* (the *Cynanche Trachealis Humida* of RUSH; the *Mucous Croup* of some modern authors). — This form is not infrequent in young children of the lymphatic temperament, who are fat and flabby, with a white soft skin. It is often met with soon after the period of weaning, and in those who are brought up without the breast. It commences with coryza, and the other symptoms of catarrh, and often with little fever. After these signs have been present for some time, or sometimes without these being so marked as to attract attention, it generally attacks the child in the evening or during the night, and manifests itself in a decided manner by the sudden occurrence of a hoarse, suffocating, dry, sonorous, or shrill cough, with a sibilous inspiration. The seizure is usually severe, and is attended with manifest alarm to the patient. The countenance is pale, and covered by perspiration, and the lips are violet. Several slighter fits succeed to this first attack; the voice remains hoarse and low, the respiration sibilous and slightly difficult; but a remission usually takes place in the morning, and there is generally but little return of the croupal cough until evening and night, when it recurs, but often in a slighter degree. In some cases, the invasion is more gradual; the remissions but slight, or hardly evident, and the accession of expectoration much earlier; the disease approaching nearer, as respects its seat and character, to acute bronchitis. There is but little fever, the skin is not much warmer than natural, and the powers of life are not remarkably depressed. The throat and pharynx are unaffected. After the first, second, or third day, the cough is no longer dry, its fits become shorter, is sometimes accompanied with a mucous rattle, and begins to terminate in the expectoration of a thick glairy mucus. The disease now assumes many of the features of, or passes into, bronchitis. M. GUERSENT considers that this is merely a false or bastard croup. I believe that it is a milder form of the disease; and that it consists of a slighter degree of the inflammatory irritation of the same parts which are affected in the true croup; but that, in consequence of the much less severity, or some other modification, of the diseased action, and constitution of the patient, glairy mucus merely, instead of an albuminous exudation of a firm consistence, is thrown out; and that, when the features of bronchitis are assumed, the inflammatory action has extended down as far as the small bronchi.

14. 3d. *Of croup with predominance of spasmodic and nervous symptoms* (the *Laryngismus Stridulus* of GOOD; *Spasmodic Croup* of WICHMANN, MICHAËLIS, DOUBLE, &c.; and the *Acute Asthma of Infants* of SIMPSON and MILLAR). This variety of croup has been described by German and French authors, under the name of MILLAR's *Asthma* and has given occasion to much discussion relative to its being a variety of croup, or a distinct disease. Of its being the former, however, there cannot be the least doubt. It occurs chiefly in children who are weak, irritable, subjects of worms, and of the nervous temperament; and comes on most commonly in the night, often during the patient's first sleep, frequently without well-marked premonitory symptoms, excepting languor, listlessness, headach, fretfulness, and sometimes a short tickling cough; and these may be slight, or of short duration. The child is suddenly wakened by great difficulty of breathing, cough, and general agitation, and continues thus affected for some time; the symptoms gradually subsiding towards morning, or being more quickly relieved by the cough terminating in vomiting. This form of the disease always presents complete remissions during the day, with exacerbations in the evening and night, and thus assumes a regular type; but the remissions often become less complete and of shorter duration, the exacerbations more frequent and prolonged, and the cough, difficulty of respiration, general agitation, and convulsive movements attending them, more severe. There is little or no increase of animal heat or fever, nor actual pain in the larynx and trachea, but a sensation of constriction and uneasiness. The countenance is generally pale in the remissions, and sometimes tumid and livid in the exacerbations, during which the respiration becomes sonorous, laborious, convulsive, and croaking: the extremities are usually cool. The cough continues dry, and accompanied with marked irritability, until the favourable termination of the disease; when slight or moderate glairy expectoration takes place, but without any membranous substances mixed with it. The pulse is very variable; sometimes small, frequent, and constricted; occasionally slow; but generally at last unequal, weak, or intermitting. The urine is paler than in the common and more inflammatory states of the disease, in larger quantity, and sometimes deposits a nebulous sediment. In this variety, the nervous and spasmodic symptoms are present from the commencement; in the former, they appear chiefly in the two last stages; the more common and inflammatory croup sometimes thus passing into the spasmodic.

15. Such are the usual characters of the well-marked spasmodic variety of croup; but cases of so pure and unmixed a form are comparatively rarely met with in practice; as the intermediate shades between the state of disease now described, and either of those preceding, are more commonly observed, at least in this metropolis and vicinity. I have scarcely ever seen a well-defined case unconnected with dentition; or one terminate fatally without the occurrence of convulsions in its advanced stages, or towards its termination; and it has very commonly presented evidence of cerebral congestion. On *dissection* of fatal cases, M. GUERSENT states, that albuminous concretions—sometimes extensive, but more frequently consisting of small isolated patches—are found in the larynx; whilst MILLAR and RUSH detected little or no lesion of the air-passages. In the very few opportunities I have had of examining the state of parts in the more purely spasmodic cases of croup, an adhesive glairy fluid, with patches of vascularity, were observed in the epiglottis and larynx, and a similar fluid was found in the large bronchi. Congestions of the brain, particularly about its base and medulla oblongata, and of the lungs, cavities of the heart and large vessels, were also found; but these were most probably consecutive changes merely.

16. iii. COMPLICATIONS OF CROUP.—*A. With*

Cynanche maligna. This complication is distinctly alluded to by JOHNSTONE, WITHERING, CULLEN, and several contemporary authors; and is common in the epidemic visitations of this disease, or of anginous scarlatina; the greater number of fatal cases exhibiting soft fragments of false membranes, of a greyish or ash colour, covering the larynx and trachea, and a livid appearance of parts of the subjacent mucous membrane. This is one of the most dangerous complications of the disease. The affection of the air-passages is here consecutive, and the difficulty of swallowing usually precedes the characteristic symptoms of croup, which are generally accompanied with great fœtor of the breath. — *a.* In many instances of the malignant sore throat, the exudation thrown out from the inflamed surface forms a pellicle coextensive with the spread of the inflammatory process from the *fauces* to the pharynx and air-passages. In some cases, ulceration, and slight apparent sloughing, occur in the central parts, and those first affected; whilst the surrounding surface, and parts subsequently diseased, become covered by a soft and easily lacerated exudation. In rare cases the inflammation commences in the *pharynx* (*Cynanche Pharyngea*), and spreads to the fauces on the one side, and down the larynx, trachea, and œsophagus on the other. In these, the pellicular exudation formed on the inflamed surface very nearly approaches that of croup; oftener, however, it is of a darker and dirtier colour, softer, and not so continuous: whilst in some cases it is formed in patches, is similar to thin sloughs, and is interrupted in parts by a dark, foul, but not concrete secretion; the subjacent mucous surface being of a dark, livid, or brick-red colour, or ulcerated, or even partially sloughed. Sloughing, however, or even ulceration, although mentioned by several writers, is comparatively rare; the more frequent commencement of the faucial or pharyngeal complication of croup being attended by the pellicular or concreted exudation now mentioned, without sloughing. The above changes are most remarkable in the pharynx, and are slighter in the larynx and trachea; the exudation being there somewhat paler, and from its colour and appearance very generally mistaken, both while adherent to, and whilst being detached from, the inflamed surface, for sphacelated sloughs, particularly as observed in the throat, and described as such. The complication, with croup, of various states of angina or sore throat — malignant, or epidemic — whether commencing in the pharynx, or in the fauces and extending to the pharynx, is not uncommon. Epidemic visitations of it have occurred in very modern times, and have been described by HAMILTON, DESLANDES, BOURGEOIS, BRETONNEAU, TROUSSEAU, MORONVAL, EMANGARD, SCHMIDTMANN, and others. — *β.* In some cases the affection originates in the *tonsils* (*Cynanche Tonsillaris*, &c.) and extends to the adjoining parts. In the croup epidemic in Buckinghamshire in 1793, and described by Mr. RUMSEY, the croupal symptoms were stated to have been coeval with "inflammation and swelling of the tonsils, uvula, and velatum pendulum palati; and large films of a white substance were formed on the tonsils." Similar appearances have likewise been noticed by FERRIAR, HOSACK, MACKENZIE, ROBERTSON, and BOURGEOIS, and by myself; the pellicular exudation extending over the fauces, down into the pharynx and larynx. The croup which has been described by LOUIS, HUFELAND, and others, as occurring in *adults*, was thus complicated. The complication with the malignant sore throat has been observed by me both in its *simple form* and in its *association with scarlet fever*. Some years since I attended, early in the winter, some of the children of a numerous family residing a few miles from town, in a low and damp situation. They had had scarlatina, with very severe sore throat, two or three years previously. On this occasion, one of the oldest was seized with malignant angina, extending to the pharynx, and along the Eustachian tube to the ear, with fœtid respiration, and irritation of the larynx, producing a constant tickling cough. A similar affection spread to four of the younger children, and in two of them it was complicated with croup; the symptoms of which were severe, continued, and well marked in one, and more spasmodic and intermittent in the other. In these, ash-coloured exudations covered the greater part of the fauces and tonsils, and extended down into the pharynx. They recovered with difficulty, by the means hereafter to be noticed.

17. *B.* Croup may be also complicated with *Thrush.*—Cases of this description are rare. I have seen only two of which I have taken any account. This association has also been observed by JURINE, DOUBLE, PINEL, and ROYER-COLLARD, who notice the adynamic or ataxic character of the fever accompanying it; the adynamic state being the consequence chiefly of this associated disorder supervening upon pre-existing disease, generally of the digestive mucous surface, and often, moreover, in a weak and cachectic system. The patches of pellicular exudation in the mouth and throat, characteristic of thrush, had extended down the pharynx, larynx, and part of the œsophagus, in these cases: death having been occasioned by the consequent irritation, and frequent recurrence of spasm of the larynx. In the only one I had an opportunity of examining after death, there was little or no inflammation in the trachea; but there was considerable vascular injection of the pharynx, epiglottis, and larynx, which were covered by a cream-like exudation, their mucous membrane being softened. The trachea and bronchi contained some flocculent viscid mucus; and the digestive villous surface, particularly in the upper part of the œsophagus, stomach, and portions of the small intestines, was softened and inflamed. In all the foregoing complications, the affection of the larynx and epiglottis is generally more remarkable than that of the trachea.

18. *C. With the exanthemetous fevers.*— *a.* Croup sometimes comes on during the eruptive fever, or efflorescence of *measles*; when it occasionally assumes more of the remitting and spasmodic character, and is seldom very severe or dangerous. In this case it generally subsides as the eruption becomes abundant. But it also supervenes upon the extinction of the eruption; or it does not appear until during or after desquamation; and, in some instances, not until advanced convalescence. When this occurs, the inflammatory fever soon passes into an adynamic state, and the disease assumes a severe form, with spasms of the larynx, often terminating with convulsions and suffocation. In one instance of this kind that occurred in my practice, much swelling and œdema of the throat appeared ex-

ternally, and aggravated the symptoms; recovery, however, unexpectedly took place, with a free discharge of glairy mucus, and concrete fragments of membrane. In another instance, emphysema of the throat occurred, and gradually extended over the neck, chest, and face. Permission was not obtained to examine the body, so that the channel through which the air had passed from the respiratory passages into the cellular tissue could not be exactly ascertained. — *b*. The complication with *small-pox* has been very particularly noticed by Pinel, Albers, Vieusseux, and Royer-Collard, and is not uncommon. It usually occurs in the more severe cases, particularly when the disease is confluent, and generally comes on slowly in the suppurative stage. In the more malignant cases, the difficulty of respiration is excessive; the voice very hoarse or suppressed; the paroxysms of suffocation extreme; the cough dry, or giving issue merely to a small quantity of dirty serum, or muco-sanguineous matter; and the attendant fever adynamic. On dissection, a membranous substance is seldom found in the larynx or trachea, but merely portions of a semi-concrete matter, with spots of intense inflammation in these parts, the epiglottis, and large bronchi. — *c*. The complication with *scarlet fever* is never met with excepting this disease be associated with sore throat, especially when malignant or epidemic (§ 16.). — *d*. The association, or rather the supervention of croup on *erysipelas*, particularly of the head and face, occurring in adults, has been observed by Forestus (*Opera*, l. xv. obs. 20.), Latour, Stevenson, and Gibson (*Trans. of Med.-Chirurg. Soc. of Edin.* vol. ii. p. 95.). In those cases, the inflammation and characteristic exudation spread from the fauces to the air-passage.

19. *D. With other diseases.*—*a*. Croup is sometimes associated with *acute bronchitis;* and when it terminates fatally, it is often in consequence of extension of the inflammation to the *bronchi*, and thence to the substance of the lungs, *pneumonia* thus also supervening. But the croup may also, although much more rarely, be consequent upon bronchitis. *b*. It may occur in the course of *pertussis*, and it then usually assumes the remittent and spasmodic, or the bronchial forms. *c*. Lastly, it may be associated with *œsophagitis;* but when this is the case the inflammation with albuminous exudation usually commences in the pharynx, and extends down the œsophagus, and to the larynx. This is not an infrequent occurrence in children under two or three years of age; as, indeed, M. Guersent has remarked; the larynx and epiglottis being the only parts of the air-passages affected; and these chiefly with spasm, from the irritation of the portions of false membrane covering or coming in contact with them.

20. II. Terminations and Prognosis. — Croup may terminate—1st, in recovery; 2d, it may pass into or excite some other disease, — a return to health, or a fatal issue, taking place mediately through it; 3d, in death, either from exhaustion of the vital energies, or from suffocation. *A*. A return to *health* is indicated by the mild form of the disease; by the quiet respiration whilst the cough is absent; by the moderate excitement and frequency of the pulse; by a looser cough and a more natural state of voice, followed by expectoration of viscid mucus and membranous fragments; by a copious and general perspiration on the third day, the symptoms being moderate; by epistaxis on the second, third, fourth, or fifth days; by the absence or subsidence of violent attacks of spasm of the glottis, and suffocation; by the simple and uncomplicated state of the disease; and the absence of exhaustion, or of great frequency or irregularity of pulse, and of other signs of adynamia.

21. *B*. It may excite additional disease, or pass into some other malady, — a circumstance which, although not necessarily fatal, may greatly increase the danger. The morbid state of the system, and general depression of vital power accompanying most of the complications now noticed; the more constant affection, and disposition to spasmodic action of the larynx, in all of them; the interruption caused to the respiratory processes, and the attendant or consequent congestion of the lungs, as well as the marked disposition they create to consecutive disturbance; greatly augment their danger generally. The disorders consequent upon the simple and complicated states of croup are both direct and indirect. The direct are — *a*. Extension of inflammatory action to the bronchi and substance of the lungs, — generally an unfavourable event, and indicated chiefly by the unremitting persistence of the symptoms, by deep suffocating paroxysms of cough, great frequency of pulse, lividity or leaden hue of the countenance, by the dark tinge of the lips and tongue, cold clammy perspirations, somnolency, and all the characters of asthenic Bronchitis (§ 37.). When the bronchial affection does not appear until during convalescence, it is more slight, unless the causes have been energetic, and it presents more of the usual characters and states of that disease. The consecutive occurrence of either pneumonia or any of the forms of bronchitis should be carefully enquired after, by observing the symptoms, and examining the chest by auscultation. — *b*. Extension of disease to the sub-mucous and follicular structures, occasioning inflammation and ulceration of these tissues, with symptoms of laryngeal or tracheal consumption upon the subsidence of croup, is a much more rare occurrence than the preceding; but, when it takes place, a muco-puriform expectoration accompanies and follows the characteristic discharge and signs of croup, with pain and irritation in the larynx and trachea, recurring exacerbations of suffocating cough, and difficulty of breathing, chiefly of a spasmodic description, particularly when the inflammatory irritation is seated in the larynx or epiglottis, and the usual symptoms of hectic. The very marked tendency, also, of the disease to *relapse*, is in a great measure owing to the persistence of a slight degree of inflammatory action in the large bronchi, or in the trachea and larynx, for some time after the membranous exudation on the diseased surface has been thrown off; the disorder being readily aggravated upon exposure to the exciting causes. This disposition of the disease to return diminishes with the length of time that has elapsed from the subsidence of the original attack, but does not altogether disappear for many weeks, or even for months, especially in some constitutions, and in the last and first months of the year; and even more than one relapse may take place in weak, irritable, and nervous frames, but generally in a more spasmodic

form. — *c*. Besides producing these, it may occasion, although very rarely, abscess in the vicinity of the larynx or trachea. I believe that dilatation of the bronchi is a much more frequent result. — *d*. Of the more indirect terminations and consequences of this disease, congestions of the encephalon, giving rise to *convulsions* and effusion of serum in the ventricles, or between the membranes, are the most important. In many cases, particularly in delicate and nervous children, the convulsive movements seem to commence with the spasmodic actions of the laryngeal muscles, and the strangulation thereby occasioned; the head and neck being thrown back, and all the limbs convulsed. Life is in some cases thus terminated by asphyxy. Jurine, Vieusseux, and myself, have met with cases of *hydrocephalus* following the disease; but they are not common.

22. *C. Danger* is to be dreaded, when fever is very high early in the disease, and when respiration is permanently audible, cooing, and laborious, or as described above (§ 7.). When the disease goes on to the third stage, notwithstanding the treatment; when it presents any of the complications (§ 16.) and consecutive affections (§ 21.) already noticed; when the discharge of the characteristic exudation does not take place, or when the expectoration of fragments of it is not followed by any relief; when the countenance becomes livid or leaden, the eyes sunk, the lips and tongue dark, and the pulse very frequent, small, weak, and irregular; and the other symptoms of vital exhaustion appear; *great danger* exists. A *fatal issue* is to be expected when the patient presents the appearances described as characterising the third stage, particularly those noticed as marking its close (§ 8.).

23. III. Diagnosis.—The hoarseness, and the loud, sonorous, and ringing cough; the forcible and difficult inspirations; flushed face; injected and watery eyes; the frequent and hard pulse, with thirst and inflammatory fever, the heaving of the thorax and motion of the trachea, in the developed stage; and the husky choking cough, the whispering voice, and wheezing respiration, &c. of the third stage; sufficiently distinguish this disease from any other. When it is uncomplicated, nothing beyond a slight redness is ever observed in the throat; and there is little or no pain upon deglutition, unless the larynx be much affected. — *a*. Croup can scarcely ever be mistaken for *Cynanche maligna*, or *C. Pharyngea*, or any other form of sore throat, as long as these affections do not extend to the larynx; as the great difficulty of deglutition, and the but little disturbed state of respiration, independently of the obvious affection of the throat, &c., are sufficient to distinguish between them. When, however, portions of the concreted exudations in these affections irritate the glottis, they occasion a short, tickling, dry cough; and even excite, in some cases, strangulating spasms of the larynx, nearly resembling croup, particularly when it is complicated with these maladies. If, however, it be thus associated, the croupal characters, in addition to the appearances in the throat and pharynx, will be too evident to be misunderstood; the descriptions already given of these complications being sufficient to point them out.— *b*. During the eruptive fever of *measles*, the tracheal affection is often so great as to simulate croup; and in many cases it even amounts, as already stated, to a slighter form of the complaint, which usually disappears as the eruption becomes matured: but attention to the symptoms will readily show the nature of the disorder, and how far the affection of the larynx and trachea should be viewed as a symptom, or as an important complication of the exanthematous disease. — *c*. Croup may readily be distinguished from *bronchitis*, by its sudden and severe attack; its occurrence in the evening and at night; its remissions; the hoarseness, and the ringing, dry, and frequent cough; the difficult inspirations, and impeded respiration; the altered voice and speech; the sensations and symptoms referrible to the trachea in the former, and to the sternum and chest in the latter; and by the absence of expectoration until late in the disease, when it is membranous or tubular, and not mucous and muco-puriform as in bronchitis, until after the discharge of the membranous exudations. These characters will also serve to indicate the supervention of croup on bronchitis, — an occurrence which is sometimes observed, although much more rarely than that of bronchitis on croup. — *d*. *Laryngitis* is with greater difficulty distinguished from croup than the foregoing, and in many respects there is little or no difference. The practical importance of the diagnosis may not appear great, but it is sufficiently so to warrant an accurate distinction. 1st. True laryngitis occurs in adults; seldom, in children, in any other form than associated with either the simple or complicated states of croup. 2d. It is a purely inflammatory disease, attended by a fixed burning pain in the larynx, increased on pressure and examination; and, when attacking adults, never gives rise to a false membrane, unless it be superinduced in the specific and epidemic forms of cynanche, and then it assumes modified characters. 3d. It more frequently terminates in the manner characterising acute inflammations, viz. ulceration and suppuration, than when the larynx is affected in croup. 4th. It is more acutely and constantly inflammatory, the symptoms are more continued, and it is more benefited by a purely antiphlogistic treatment, than croup. 5th. It much oftener passes into the chronic form, than the latter disease. (See Larynx — *Inflammations of*.) — *e*. *Chronic laryngeal* and *tracheal inflammation* — the laryngeal and tracheal consumption of some writers — resemble croup, in the hoarse voice, harsh dry cough, and the difficulty of respiration; but their progress is much slower, and less acute, than croup; they do not present the violent paroxysms towards night; they seldom or never are observed in children; and ulceration of these parts of the air-passages is always found in fatal cases. — *f*. Croup may also be confounded with the diffusive inflammation which sometimes attacks, either primarily or consecutively, the cellular tissue about the throat, or with abscesses in the same situation; either of which may involve the larynx and membranous part of the trachea, or so affect them as to give rise to croupal symptoms; but the external appearances, the difficult deglutition, the state of the throat, and the history of the case, will at once show the differences existing between them. — *g*. *Pertussis* and croup can hardly be mistaken for each other; the invasion, characters, and progress of both diseases being so very

different. The prolonged whoop, the unchanged voice, and the occurrence of the cough in convulsive paroxysms after a meal, terminating in vomiting and a copious discharge of a clear and glairy fluid; the complete intermissions, respiration, voice and speech remaining unaffected; the almost entire absence of fever, and the much more slight and chronic form, of the latter disease in its uncomplicated state; are sufficient distinctions. Croup may, however, occur in the course of hooping cough; but then its characteristic symptoms will make it apparent to the attentive observer, and point out the nature of the resulting association. — *h.* The effects following *substances that have escaped into the trachea* often resemble croup; but may be distinguished from it by the sudden occurrence of pain and suffocation; by the frequent change of the exact seat of uneasiness with the change of the situation of the foreign body; the dryness of the cough, and the violence of the strangulation; and by the irregularity, the completeness, and sometimes the long continuance, of the intermissions. When a foreign substance passes into the glottis, and is retained there, suffocation is generally occasioned either from the size of the substance, or from the spasmodic constriction of the muscles of the larynx occasioned by it. — *i. Hysteria* may also simulate croup; but the age of the patient, the history of the case, and the local and general symptoms, if attentively observed, will indicate the nature of the affection. — *k.* The spasmodic states of croup closely approach to *convulsive spasm of the larynx;* but the absence of cough and fever, the brief fits of strangulation, the complete intermissions, the spasm of the thumbs and toes, the purplish countenance, and the general convulsions, will distinguish that affection from any form of croup. (See LARYNX — *Convulsive Spasm of.*)

24. IV. CAUSES. — *A. a.* Croup is more frequent in cold and moist climates than in those which are warm. Rapid and frequent vicissitudes of season, weather, and temperature, have considerable influence in producing it. Hence its prevalence in the valleys of Switzerland and Savoy; in this country, particularly on its eastern side; in the other northwest countries of Europe; and in North America. But the middle, and even the south of Europe, are not exempt from it. M. VALENTIN has shown its frequency in the middle and southern provinces of France, GOELIS in Vienna, and GHISI in the north of Italy. Sir JAMES M'GRIGOR notices its prevalence — probably in a complicated form, from its occurrence also in adults (§ 25.) — at Bombay, in 1800. According to the information given by JURINE, LENTIN, CHEYNE, and others, we might be led to infer that it has been more common in very modern times than formerly: the difference may, however, be owing to its having been mistaken for some other affection. I believe that it has not been so frequently met with during the preceding five years, as it was about twenty or thirty years ago. M. JURINE remarks, that, although the table he has given of the number of cases from 1760 to 1807, shows a nearly progressive increase, yet he has observed, at Geneva, no increase during the last eighteen years preceding the date of his work. The following evidence, nevertheless, would render it evident that, in some countries at least, croup is more prevalent now than formerly. According to the information given by Dr. COOKSON, a practitioner of forty years' experience in Lancaster had never seen it until 1760. Dr. FRIEDLANDER (*Journ. de Montpellier*, No. IX. p. 276.), states, that it has become yearly more prevalent in Vienna; and that the physician to the Hospital for Children, who had treated, from 1774 to 1817, nearly 60,000 children, did not meet with a single case in the three first years of his practice, saw it but rarely during the next six years, and yet treated 1665 cases of it in the last five years of this period. Similar facts are also furnished by Dr. GOELIS. Although croup occurs at all seasons of the year, it is most prevalent in those which are cold and moist, or when the alternations of temperature are sudden and remarkable. I have observed it more frequently in the months of January, February, March, April, November, and December, especially if east or north-east winds prevail after heavy or continued falls of rain. I believe that the above results are nearly in accordance with those furnished by JURINE, CRAWFORD, MICHAËLIS, DOUBLE, and BRICHETEAU.

25. *b.* The great susceptibility of *early age*, and the narrowness of the larynx previously to puberty, have generally been supposed to favour the occurrence of croup. M. BLAUD, however, denies that this latter circumstance has any influence in causing it. This is doubtless the case in respect of the *production* of the disease, but not as regards its *severity* and *danger*, both of which it evidently increases. It is rare to meet with croup until after the child has been weaned: I have, however, seen it in children at the breast, as early as three, four, five, and six months of age; but much more frequently at this age in those who have been brought up by hand; and in a still greater number of instances, at from seven months to upwards of a twelvemonth, in those which have been recently weaned. M. DUGES states, that he met with an instance of it in an infant of a few days old. The age at which the disease is most common is, according to my experience, from one year to nine. But it not infrequently occurs at both an earlier and a later period. VAN BERGEN states, that it is often observed from the age of two to five years inclusive: HOME assigns from fifteen months to twelve years: CRAWFORD mentions some cases from fifteen months to two years, but gives the age of from two to eight as the most common: CHEYNE, from sixteen months to twelve years; SALOMON, from two to five years inclusive; MICHAËLIS, from fifteen months to ten years: ZOBEL, from the latter months of suckling to nine years; VIEUSSEUX, from seven months to ten years: BERNARD, from one to six years; BARTHEZ, from two to ten; RUMSEY, till fourteen; and CAILLAU, from eighteen months to eleven years. The foregoing applies only to the simple and uncomplicated disease. When it occurs in a complicated form, or consecutively upon anginous affections, particularly upon inflammation of the pharynx, tonsils, or fauces, or on the exanthematous diseases, it may, and, indeed, occasionally does, occur in adult subjects, and in infants of a more tender age. The cases published by M. LOUIS, and denominated by him croup in the *adult*, were instances of the anginous complication. Although the occurrence of uncomplicated croup in adults is very

rare, cases have been observed by Hosack, Mitchell, Mills, and Latour.

26. *c.* M. Blaud and Dr. Albers observe, that *boys* more frequently contract the disease than *girls*, owing to the greater exposure of the former to its exciting causes. This opinion has been opposed by MM. Double and Royer-Collard; whilst Dr. Jurine states, that of ninety-one cases he treated up to 1808, fifty-four were boys, and thirty-seven girls; and of twenty-eight cases which occurred in 1808, eighteen were boys, and ten girls. According to his observation, also, the greater number of cases occurred at the age of two, three, and four years; and next at one, five, and seven. This accords with my own experience, which is further supported by that of Goelis, who, from 1797 to 1808, treated 252 cases of the disease, of which number 144 were boys, and 108 girls.

27. *d.* The nervous and sanguine *temperaments*, or a mixture of the two — the spasmodic characters predominating in the former, the inflammatory in the latter — with a tendency to a fulness of habit, seem to predispose to croup. That it will, however, often come on independently of plethora, cannot be disputed. I have seen it in infants of about four months old, brought up by hand; and even in these, soon after having lost much blood in the treatment of other diseases, especially when cold easterly winds occur in the spring or autumn, after heavy falls of rain. Cheyne, and some others, conceive that an hereditary tendency exists in croup. But this is not made out: for, as M. Desruelles has judiciously remarked, the only proof that can be brought in support of it, is the circumstance of two or more children being seized with it in the same family; an occurrence which may be explained by the susceptibility of age and temperament, being often necessarily the same in several of them; and by their being exposed to the same agents, and placed under similar circumstances.

28. *e.* The *localities* in which this disease seems *most* prevalent are those which are low and moist, near the sea, on the banks of large rivers or lakes, or near marshes, in the depths of low valleys, or at the bases of precipitous mountains. Hence the endemic character, which some writers have imposed on it, but which is not strictly applicable; for, although it is more frequently observed in the above situations, yet it is also often met with in places very oppositely circumstanced; and it cannot, therefore, strictly be said to be an *endemic* disease.

29. *f.* The *epidemic* prevalence of croup has been contended for, and denied, by writers. Some consider it as entirely sporadic and accidental; others suppose that it may become epidemic consecutively upon catarrhal epidemics, and that it has no other claims to such a character; whilst many believe that it occasionally appears in an epidemic form. That it has so occurred in former times appears evident. Baillou manifestly observed it in an epidemic form, in Paris, in 1576; Ghisi, at Cremona, in 1747; Starr, in Cornwall, in 1748; Rosenstein, in Upsal, &c., in 1762; Van Bergen, in Frankfort, in 1764; Walhbom and Baeck, in some parts of Sweden, in 1768 and 1772; Barker and Most, in some places in the United States; Autenreith, at Stutgardt, in 1807; Albers and others, in parts of Saxony, in 1807 and 1808; Schmidtmann, in 1811; and various other writers during the last fifty years. My own observation would lead me to infer, that, although croup is generally a sporadic disease, occurring occasionally at all seasons, yet it sometimes assumes epidemic features, both in respect of its simple state, and its complications with other species of angina, particularly at periods when they or catarrhal affections prevail — the seasons favourable to the production of these diseases most frequently occasioning this malady also. This opinion derives support from the numerous facts furnished by Rumsey, Pinel, Jurine, Goelis, Albers, Royer-Collard, Bricheteau, Bretonneau, and other writers referred to at the end of this article.

30. *g.* Several authors, particularly Wichmann, Boehmer, Field, Rosen, Goelis, Lobstein, Guersent, Louis, Shultz, and G. Gregory, have adduced facts to show that the disease may occasionally prove *infectious*. The two early Swedish writers contemporary with Home, namely, Halen and Wahlbom, assert its infectious nature. On the other hand, this property is denied by Chalmers, Michaëlis, Thilenius, Double, and Albers. It has most indubitably manifested this property when it has prevailed epidemically, and when associated with cynanche maligna, and some other exanthematous or anginous affections. On several occasions, however, of its occurrence within a short time, in two or more members of the same family, it has evidently proceeded from the same causes acting upon similar states of susceptibility and disposition. But even the simple form of the disease has appeared in children who have slept in the same bed with another affected by it. Two or three such cases have occurred under my own observation; and others are recorded by Goelis, and some other authors now mentioned. Whether or not it was produced in these cases by inhaling the air respired by the affected child, or by the causes above stated, may be disputed. Yet it is probable that the air which has been respired by the affected may sometimes be a concurrent or determining cause of it in others.

31. *B.* Although the foregoing may be considered as *predisposing* causes merely, yet they are very commonly the only *exciting causes* which can be detected. There is no doubt, however, that the causes which occasion common catarrh and bronchitis sometimes also give rise to croup. It is also not infrequently excited by, or at least consecutive of, bronchitis, hooping cough, the various forms of cynanche, measles, erysipelas, and scarlet fever; and it occasionally also appears during advanced convalescence from these, especially the latter; and, indeed, from other acute diseases. Also running against the wind, crying, and exertions of the voice; cold acting in any manner, or upon any part of the body, particularly upon the neck and throat; having the hair cut short during cold or windy weather; habitual exposure, and the laying aside the accustomed covering of the neck and chest; and even accidental attempts at swallowing substances of an acrid nature, or of a very high temperature; have sometimes produced croup. The retrocession of the above eruptive diseases, and the suppression of other eruptions, or of discharges, secretions, and excretions, are amongst its most frequent causes.

32. V. Pathology of Croup. — i. *Lesions observed in fatal cases.* A précise idea of the

organic changes which take place in the course of the disease is necessary to enable us to devise, at the commencement, appropriate means, both for their prevention, and for their removal when prevention is unattainable. The lesions observed in fatal cases, and present in all, to a greater or less extent, may be referred to two heads.— 1st. Inflammation with tumefaction, redness, injection of the blood-vessels, and slight softening of the mucous membrane of the air-passages. 2d. An albuminous exudation in the form of a false membrane, or a thick, glutinous, and stringy mucus, or both. (See BRONCHI AND AIR-PASSAGES — *Lesions of*, § 12.) *A*. The former of these is usually observed, varying, however, in respect both of intensity, and extent of surface affected. In some cases, they are limited to the upper part of the trachea; in others, they extend to the larynx, or to both the larynx and first divisions of the bronchi, or to the latter merely; and, in complicated cases particularly, or when the disease assumes a seemingly epidemic, or even infectious character, the inflammatory states now enumerated, with the characteristic secretion, exist also in the pharynx and fauces, and advance downwards to the ramifications of the bronchi. In the most acute forms of the disease, the mucous surface of the trachea and larynx assumes the above inflammatory appearances in the course of a few hours. In the second stage of the disease, it becomes streaked or partially covered by an albuminous, and sometimes a sanguinolent exudation.; and in the last stage, this exudation has concreted to a more or less complete membrane; the inflammatory states of the surface underneath still remaining, but in a less distinct manner, and occasionaly in patches or streaks only. In some cases, the injection of the vessels, and tumefaction of the surface, are but slight, yet the exudation of a thick concrete membrane exists to a considerable extent; in others, it is thin and scanty, or almost entirely consists of a thick tenacious mucus.

33. *B*. The morbid exudation varies much in consistence, in quantity, and the extent of surface covered by it. In some complicated or consecutive cases, already alluded to, a false membrane has formed from the fauces to the last ramifications of the bronchi. MM. BRETONNEAU and BRICHETEAU have observed it without any breach of continuity throughout the whole of this extent. I have never met with an instance where it was so extensive, without interruptions, particularly in the bronchi and about the larynx. In the greater number of the pure uncomplicated cases of the disease, the concretion exists principally in the upper part of the trachea. In the more acutely inflammatory, it extends to the larynx and epiglottis; in others, to the first ramifications of the bronchi; and in a few, in both directions. In the complicated cases, and in those of an apparently epidemic and infectious nature, the throat is equally affected, constituting the *Diphtherite*, or the *Inflammation pelliculaire* of M. BRETONNEAU. This false membrane is whitish, greyish white, or passing to a greyish yellow. Its thickness varies considerably. MICHAËLIS and BARD consider a line and half, or two lines, to be its utmost thickness. I have certainly seen portions quite as thick, but not thicker, and sometimes evidently consisting of two or more distinct layers. It is thickest in the posterior and superior part of the trachea, and thinnest about the larynx and epiglottis, when it extends thither, and in the lowest and anterior part of the trachea. Its consistence and tenacity also vary extremely, not only in different, but also in the same case. It is almost universally softest where it approaches the bronchi, where it generally passes into a thick glutinous mucus. The more consistent and firm it is, the more perfectly is it moulded upon the surface from which it was secreted. But when the consistence is slight, it forms merely membranous shreds, or soft polypous concretions, intermingled with a thick glutinous mucus. The interior of those exudations is generally covered with a whitish tenacious mucus; and their exterior, or the surface which has been in contact with the inflamed mucous membrane, is sometimes dotted with minute specks of blood. In some cases, these concretions are found still adhering to the surface on which they are formed; in others, they are either partially or altogether detached from it by a puriform mucus.

34. The state of the exudation varies with the stage of the disease, the intensity of the inflammation, and the treatment which has been adopted. Thus, when a child dies very early in the malady, instead of the albuminous coating above described, a tenacious, or reddish, frothy mucus is only found. In this comparatively rare case, the spasm of the air-passages attending the inflammation, together with the obstruction occasioned by this mucus, has produced asphyxia. It seems that this glutinous exudation becomes more condensed, and moulded into a false membrane, or partially assumes this state, as the disease advances. (See BRONCHI AND AIR-PASSAGES.)

35. *C*. In many cases, instead of a membranous exudation, a viscous, muco-puriform matter lines the trachea only, or both the trachea and larynx, as remarked by FRANK, VIEUSSEUX, VALENTIN, DOUBLE, DESRUELLES, BRICHETEAU, BLAUD, and ODIER. This substance is whitish, greyish, or yellowish grey, and occasionally flocculent. It is not infrequently formed in considerable quantity in the more acutely inflammatory cases (§ 12.), and particularly in those which terminate fatally in some hours. It seems as if the quantity of thick viscous matter thrown out on the inflamed surface, together with the spasm of the trachea and larynx, occasioned suffocation before it could be condensed into a membranous substance. Cases of this description have been particularly noticed by M. ROYER-COLLARD, and have occasionally come before me in practice. I have sometimes also observed a thick, stringy, and adhesive matter, of a greyish white colour, in the superior and posterior part of the trachea and larynx, obstructing the passage, the mucous membrane underneath being nearly altogether exempt from redness and tumefaction. In some instances, this matter has presented a muco-puriform character, varying in its shade of colour, but extremely thick and adhesive. A similar appearance has been remarked by DESRUELLES, DOUBLE, BLAUD, and BRICHETEAU. Owing to the absence of the usual marks of inflammation in the situation where this accumulation has been met with, it may be presumed that the inflammatory marks had partly dis-

appeared after the discharge of this matter; its secretion promoting the resolution of the inflammatory action, the remaining signs of which had vanished after death; the accumulated secretion which had been instrumental in occasioning dissolution alone presenting itself, the powers of life having been insufficient for its excretion. I have suspected, from observing the progress of other cases, that the inflammatory action sometimes had commenced in the bronchi, extended upwards along the trachea, and that the secretion now noticed had been chiefly furnished from the larger bronchial ramifications, and had become so thick and adhesive when it arrived at the upper part of the trachea and larynx, as not to have been expelled by the cough, but to have excited spasm of the glottis, and thereby produced suffocation. In some instances of this description, more decidedly inflammatory appearances were observed in the larger bronchi than in the trachea. It is probable in these, that the secretion found in the latter situation proceeded chiefly from the former, and that the injection of the vessels in the mucous lining of the trachea had disappeared after death.

36. *D.* Any very remarkable lesion of the tissues subjacent to the mucous surface has not been found, unless the disease has terminated in tracheal consumption. It has been a question whether or not the false membrane formed in croup is capable of becoming organised, and united to the surface that has produced it. We have no conclusive evidence of such an occurrence, although Soemmerring, Albers, and Bricheteau are inclined to believe it possible. The other morbid appearances are chiefly the consequences of the interrupted functions of respiration and circulation through the lungs; such as congestion of this organ and of the brain; hepatisation of parts of the lung; emphysema of this viscus; and, in very young children, enlargement of the thymus gland. The lesions observed in the complications of the disease, as far as they have not been already noticed, more strictly belong to the particular maladies with which it is occasionally thus associated; where they are described, and in the article Membrane.

37. ii. *Nature of the Disease.*— Different opinions have been entertained as to its inflammatory nature in all cases, the exact character of the inflammation, and the extent to which spasm of the upper parts of the air-passages may contribute to its production. The very slight inflammatory signs sometimes found in the part covered by the false membrane; the absence of these, as well as of any fluid or concrete exudation, in other cases; the circumstances under which the disease has sometimes made its appearance, and the absence of phlogistic symptoms in its course, an albuminous exudation either forming notwithstanding, or not at all; have induced several writers to consider it as not merely an inflammation of the upper part of the air-passage, but a disease of a peculiar nature, more or less connected with the state of the system, although principally affecting the trachea, and frequently the larynx and large bronchi also. The opinions of Rogery, Harles, Hecker, and many others, amount to this merely; and they seem not far from the truth. I have remarked, that, although croup assumes the more unequivocally inflammatory form in strong and plethoric children, it does not most frequently affect them, unless they be of the sanguine or irritable temperament; that it presents every shade or modification from this, to the least phlogistic, and most manifestly spasmodic, form; that even its most inflammatory state may assume a spasmodic or nervous character after large depletions, which, while they diminish, as under every other circumstance of disease, the phlogistic diathesis and symptoms, increase the nervous and spasmodic; and that, even when the first seizure has been of the inflammatory form, yet the relapses, or subsequent attacks, which are sometimes repeated several times at irregular intervals, have generally possessed more of the spasmodic character.

38. Another fact, which I have uniformly observed, appears important, namely, that the quantity of fibrine and crassamentum in the blood taken from the patient, and of albumen in the urine, have been great in proportion to the inflammatory type of the disease, and the disposition to form a false membrane; whilst in the more spasmodic varieties, in which an albuminous exudation is seldom found, or at least but sparingly, and the urine is more copious and limpid, and less, or not at all, albuminous, the blood has presented a smaller or less firm crassamentum. These facts evidently show, not only that the state of the blood is different in these forms of the disease, but that the condition of the organic nervous or vital power, upon which the appearances and constitution of the circulating fluid so closely depend, is also different; and, moreover, that the manifestations of both the one and the other will vary in the different modifications of croup, conformably with these results. The combined and reciprocative operation of the nervous influence, and the condition of the circulating fluid, will give rise, according to the state of the frame, and the nature and combination of the exciting causes, to constitutional as well as local phenomena; to a state of febrile action, which will be inflammatory in, generally, the majority of cases, nervous in others, and present more or less of gastric or even of adynamic symptoms in some, particularly when the disease occurs in a complicated or epidemic form. The importance of attending, during the treatment of particular cases, and of their different stages, to the characters of the constitutional disturbance — to the attendant fever, will be evident, as indicating not only the means to be adopted, but also the nature of the local mischief. Thus, in the cases attended by inflammatory fever, the exudation is abundant and rapidly formed; in that manifesting the nervous form, it is either scanty, imperfect, or consists of a little glairy fluid, — the spasmodic character predominating, and cerebral symptoms sometimes supervening; and in that presenting the adynamic and gastric form, it is spreading,—being seldom limited to the trachea and larynx, but often extending to the pharynx, fauces, the mouth, and even to the nostrils on the one hand, and down the œsophagus and bronchi on the other. It is in this last form that the disease presents itself when it is epidemic or infectious; and although the adynamic (or the malignant character, according to J. P. Frank) often manifests itself early, yet the antecedent febrile symptoms very evidently evince high action.

39. There is one important point not sufficiently adverted to by authors, viz. the very early period at which the tracheal exudation is often poured out, in the inflammatory states of the disease; the symptoms marking the first or premonitory period being those indicating the local developement of the malady. Thus, a healthy child has evinced no disorder for several days, or the disorder has been so slight as to escape observation — it may even be more than usually lively and alert on the day preceding the night on which it is most severely attacked; and yet, if an emetic be that instant exhibited, a large quantity of thick, glairy, sanguineous, and gelatinous matter will be brought away from the air-passages; showing that, in many instances, the early advances of the inflammatory action is slow and insidious; that the characteristic seizure often does not occur until the exudation has accumulated to a considerable extent in the trachea, or the inflammation has extended to the larynx; and that it is partly owing to the retention of this matter, —which is evidently thrown out in a fluid form,—that it concretes into a false membrane, each successive discharge sometimes forming a distinct layer. MM. GENDRIN, ANDRAL, and other pathologists, have remarked, that the inflammatory action which gives rise to the albuminous exudation on the surface of mucous membranes is of a sub-acute, rather than of an acute kind. I believe that this is the case in respect of the inflammation of the trachea and larynx, in croup; and that the formation of a false membrane is the result not so much of the sthenic or acute character of the local action, as of the abundance of albumen and fibrine in the blood,—a circumstance which partly accounts for the frequency of relapses in some children (§41. *o.*), and justifies HARLES, HECKER, and others, in considering the disease to consist of a peculiar form of inflammation. Some writers, however, suppose that the very acute symptoms, and rapid termination of many cases, militate against these opinions; but it should be recollected that, even in the most severe cases, the inflammatory action, when it commences in the trachea, often exists for several days, in the manner already noticed, until it has either extended to the larynx, or produced such a quantity of albuminous exudation as will obstruct respiration, or induce, by its irritation, spasm of the air-passages,—these effects being the chief causes of the severity and rapid termination of the disease. This will become more evident, when we consider the consequences of interrupted respiration upon the frame—whether the interruption proceed from the mechanical obstruction occasioned by the exudation and false membrane, or the frequent recurrence or continuance of spasm of the larynx and trachea; or from inflammatory action, and its consecutive exudation extending down the bronchi; or from two or all of these combined. These consequences are, in fact, the third stage of the disease; the symptoms of which are the usual phenomena resulting from obstructed respiration, interrupted circulation, and congestion of the lungs; imperfect action of the air upon the blood, and the circulation of this fluid in a nearly venous state, with congestion of the cavities of the heart, and impeded return of blood from the head. The circulation, moreover, of imperfectly arterialised blood to the nervous systems occasions lethargy, with sinking of the vital powers, and increases the disposition to spasmodic action of involuntary parts, and to convulsive movements of voluntary organs; all which (the former especially) become so prominent a character of the malady in its advanced stages, and often terminate existence. Thus it will appear manifest, — and the fact is of great practical importance, — that the severity, rapidity, and danger of croup, are not the immediate consequences of the activity or acuteness of the inflammatory action; but of the exudation to which it gives rise, and of the conformation and functions of the parts which it affects.

40. DUVAL, JURINE, ALBERS, and SCHMIDT, have considered it worth ascertaining, in how far the disease could be *artificially produced* in the lower animals; and whether or not, when thus produced, inflammation exists to the extent of accounting for the phenomena, or gives rise to a false membrane. They injected into the trachea of fowls, dogs, cats, sheep, wolves, &c. various irritating substances, as the bichloride or peroxide of mercury (SCHMIDT) dissolved in spirits of turpentine, and solutions of iodine, and nitrate of silver; they moreover made these animals inhale the fumes of sulphuric and muriatic acids; and the results were just what might have been anticipated, viz. that in some cases, inflammation without any exudation was produced; in others, a fluid, or more or less concrete exudation was found in various quantity; and in all, the matter in the air-passages was not sufficient entirely to obstruct the access of air to the lungs; thus confirming the opinion justly contended for by CULLEN and others, that a great part of the phenomena and consequences of the disease is to be attributed to spasm of the larynx and trachea. SCHMIDT succeeded in producing a false membrane only in young animals,— a fact in accordance with the spontaneous occurrence of the disease previously to puberty, and to be referred to the more albuminous state of the blood often observed at this period. It may be of importance to know that croup — identical in its phenomena and organic changes with the disease in the human subject — occurs also in several of the lower animals, especially before they are fully grown. Its occurrence in chickens is well known by the name of "*Pip.*" DUPUY, RUSH, VALENTIN, YOUATT, and others, have observed it in horses and dogs; DOUBLE, in lambs and cats; and GHISI and GOHIER, in cows. In some of these animals it has even occurred as an epidemic.

41. *Pathological Conclusions.* — Another point, of greater importance than it may at first seem, is whether or not the matter concreted and moulded on the inflamed mucous surface be exuded by this tissue itself, or secreted by the follicular glands with which it is so abundantly supplied. M. GRIMAUD has adopted the latter alternative. From particular attention I have paid to this subject, some of the results of which have been stated in the article BRONCHI (§11, 12.), I would draw the following inferences relative to it, and to the pathology of croup generally: — (*a*) That the mucous membrane itself is the seat of the inflammation of croup; and that its vessels exude the albuminous or characteristic discharge, which, from its plasticity, and the effects of temperature and the continued passage of air over it, becomes concreted into a false membrane; — (*b*) That the occasional appearance of blood-vessels in it arises

from the presence of red globules in the fluid when first exuded from the inflamed vessels, as may be ascertained by the exhibition, upon the approach of the symptoms, of a powerful emetic, which will bring away this fluid before it has concreted into a membrane; these globules generally attracting each other, and appearing like blood-vessels, as the albuminous matter coagulates on the inflamed surface ;—(*c*) That the membranous substance is detached in the advanced stages of the disease, by the secretion, from the excited mucous follicles, of a more fluid and a less coagulable matter, which is poured out between it and the mucous coat; and, as this secretion of the mucous cryptæ becomes more and more copious, the albuminous membrane is the more fully separated, and ultimately excreted if the vital powers of the respiratory organ and of the system be sufficient to accomplish it; — (*d*) That sub-acute or slight inflammatory action may be inferred as having existed, in connection with an increased proportion of fibro-albuminous matter in the blood, whenever we find the croupal productions in the air-passages; but that these are not the only morbid conditions constituting the disease; —(*e*) That, in conjunction with the foregoing, — sometimes only with the former of these in a slight degree,—there is always present, chiefly in the developed and advanced stages, much spasmodic action of the muscles of the larynx, and of the transverse fibres of the membranous part of the trachea, which, whilst it tends to loosen the attachment of the false membrane, diminishes, or momentarily shuts, the canal (of the larynx) through which the air presses into the lungs; — (*f*) That inflammatory action may exist in the trachea, and the exudation of albuminous matter may be going on, for a considerable time before they are suspected,—the accession of the spasmodic symptoms being often the first intimation of the disease; and these, with the effects of the pre-existing inflammation, give rise to the phenomena characterising the sudden seizure; —(*g*) That the modifications of croup may be referred to the varying degree and activity of the inflammatory action; the quantity, the fluidity, or plasticity of the exuded matter; the severity of spasmodic action; and to the predominance of either of these over the others in particular cases, owing to the habit of body, temperament, and treatment of the patient, &c.; — (*h*) That the muco-purulent secretion, which often accompanies or follows the detachment and discharge of the concrete or membranous matters, is the product of the consecutively excited, and slightly inflamed, state of the mucous follicles, the secretion of which acts so beneficially in detaching the false membrane; — (*i*) That a fatal issue is not caused merely by the quantity of the croupal productions accumulated in the larynx and trachea; but by the spasm, and the necessary results of interrupted respiration, and circulation through the lungs; — (*k*) That the partial detachment of fragments of membrane, particularly when they become entangled in the larynx, may excite severe, dangerous, or even fatal spasm of this part, according to its intensity relatively to the vital powers of the patient; and that this occurrence is most to be apprehended in the complicated states of the malady, where the inflammatory action, with its characteristic exudation, spreads from the fauces and pharynx to the larynx and trachea; the larynx being often chiefly affected in such cases, and, from its irritability and conformation, giving rise to a more spasmodic and dangerous form of the disease; —(*l*) That the danger attending the complications of croup is to be ascribed not only to this circumstance, but also to the depression of vital power, and the characteristic state of fever accompanying most of them, particularly in their advanced stages; — (*m*) That irritation from partially detached membranous exudations in the pharynx, or in the vicinity of the larynx or epiglottis, may produce croupal symptoms in weak, exhausted, or nervous children, without the larynx or trachea being themselves materially diseased; and that even the sympathetic irritation of teething may occasion the spasmodic form of croup, without much inflammatory irritation of the air-passages, particularly when the prima via is disordered, and the membranes about the base of the brain are in an excited state; — (*n*) That the predominance in particular cases of some one of the pathological states noticed above (*g*), as constituting the disease, and giving rise to the various modifications it presents, from the most inflammatory to the most spasmodic, may be manifested in the same case, at different stages of the malady, particularly in its simple forms, and in the relapses which may subsequently take place; the inflammatory character predominating in the early stages, and either the mucous or the spasmodic, or an association of both, in the subsequent periods; — (*o*) That the relapses, which so frequently occur after intervals of various duration, and which sometimes amount to seven or eight, or are even still more numerous, may each present different states or forms of the disease from the others; the first attack being generally the most inflammatory and severe, and the relapses of a slighter and more spasmodic kind; but in some cases this order is not observed, the second or third, or some subsequent seizure, being more severe than the rest, or even fatal, either from the inflammation and extent of exudation, or from the intensity and persistence of the spasmodic symptoms, — most frequently from this latter circumstance. The above inferences, however minute or trite they may seem, should not be overlooked, as they furnish the safest and most successful indications of cure, and are the beacons by which we are to be guided in the treatment of the disease.

42. VI. Treatment.—i. The curative Treatment of Croup. I shall first state the method of cure on which I would chiefly rely in the different modifications of the disease; and afterwards notice some of the remedies which have been recommended by various writers. Several of these are of great benefit in certain circumstances of the disease; but we can seldom depend upon any one of them: it is on a judicious combination and sequence of means that we should chiefly rely; and upon the adaptation and co-ordination of these in particular cases. The *intentions of cure* are— 1st, to diminish inflammatory and febrile action, when present; and to prevent, in these cases, the formation of a false membrane, or the accumulation of albuminous matters in the air-passages; —2d, when the time for attempting this has passed, or when it cannot be attained, to procure the discharge of these matters; — 3d, to subdue spasmodic symptoms as soon as they appear; and, 4th,

to support the powers of life in the latter stages, so as to prevent the recurrence of spasms, and to enable the system to throw off the matters exuded in the trachea.

43. *A. Treatment of the common and inflammatory Croup.* — *a.* If the practitioner see the patient in the *first stage* (§ 6.), particularly if hoarseness, or a rough cough, with other catarrhal symptoms, be present, it will be proper to give an active antimonial emetic, with the view of fulfilling the *first* of the above intentions. This will often bring away a considerable quantity of a thick, glairy, and sometimes slightly sanguineous matter from the trachea, and will give immediate, although generally only temporary, relief. If the matter discharged from the air-passages present the above appearances; if the child be plethoric, the pulse at all excited, and the countenance flushed; we should not be deceived by the calm following the full operation of the emetic, but should have recourse to blood-letting. In the majority of instances, cupping between the shoulders or on the nape of the neck, or the application of leeches on the sternum, to an extent which the age, habit of body, and strength of the patient may warrant, will be preferable to venæsection. Under these circumstances, particularly when the nausea occasioned by the emetic has hardly subsided, the abstraction of little more than an ounce, or an ounce and a half, of blood, for every year that the child may have completed, will be borne. In town practice, the local is preferable to general blood-letting; but the latter will be adopted, with advantage, in the country, amongst plethoric and robust children. The advantages of depletion and antimonials are attributable to their influence in arresting the inflammatory action, and, from the consecutively accelerated absorption of fluids into the circulation, to the relative diminution of the albuminous constituents of the blood.

44. Immediately after depletion, and an emetic, the best internal medicine undoubtedly is *calomel* and *James's powder* — from three to five grains of the former, and two or three of the latter. This powder may be repeated every second, third, or fourth hour, until two or three doses have been taken. After the firse dose, the child should be put in a tepid bath; and be allowed as much tepid diluents as the stomach will bear, in which sub-carbonate of soda may be dissolved, and which may be rendered agreeable with syrup. If the powders, given to the extent now mentioned, have not acted upon the bowels, castor oil, or some other purgative, assisted by an emetic, should be administered. These means will seldom fail of cutting short the disease. If, however, it still proceed, the means to be employed in the next stage should be adopted according to the circumstance of the case.

45. *b.* The *second or developed stage* is that in which medical aid is most frequently resorted to; and at this period, conformably with what has been stated (§ 39.), the disease is actually further advanced than the symptoms indicate. At its commencement, however, the *first intention of cure* should be attempted; but the most decided means will be now requisite to attain its fulfilment. These should be put in practice, even although the treatment already recommended may have been employed in the preceding stage. An active *antimonial emetic* should be instantly exhibited, so as to produce full vomiting; and immediately upon the conclusion of its operation, *blood-letting*, general or local, must be resorted to. The abstraction of a greater quantity than that indicated above (§ 43.) will seldom be more beneficial; nor, indeed, will it be borne without producing syncope, which, in children, especially, should be avoided, as favouring the supervention of convulsions or reaction. But it may be requisite, particularly when the patient has not lost any blood during the preceding stage, to repeat the depletion. On this, or on any future occasion of repeating it, local blood-letting, in the situations and mode already mentioned (§ 43.), is now to be preferred. If it have not been prescribed previously, the calomel and James's powder should be given every two or three hours, until three or four doses are taken; and the adjuvants directed to accompany and to follow this medicine in the first stage, should also be employed in this.

46. Having thus carried depletion as far as seems prudent, and fully evacuated the *primæ via*, and a very obvious improvement have not taken place, or if the suffocating seizures recur notwithstanding, a blister should be applied between the shoulders, on the nape of the neck, or on the epigastrium, *but never on the throat;* and if symptoms of febrile excitement still attend the seizures, a full dose of tartar emetic should be given, so as to excite vomiting again, and be repeated until it has this effect fully. If the urgent symptoms and fever still continue, *vomiting* may be excited a third or fourth time, at intervals of two or three hours. The tartar emetic is, upon the whole, the best medicine for the purpose in the early or inflammatory states of the disease, and may be given in doses of half a grain, in simple solution, to a child two or three years old, as advised by Dr. CHEYNE, and repeated at about half an hour, or sooner, if vomiting be not induced. M. GUERSENT prefers ipecacuanha, and advises blood-letting to precede the exhibition of emetics. Where the inflammatory action is considerable, this method may be adopted; but where we may expect to bring away the exuded matter by means of an emetic, before it has concreted into a membrane, it will be as well to exhibit one without delay, and to keep up a constant nausea by the same medicines given in frequent and small doses.

47. If the symptoms continue notwithstanding the judicious use of the above means, we should infer the formation of a false membrane, unless the exacerbation be altogether spasmodic — the breathing and voice becoming natural, or nearly so, in the intervals. The measures to be employed now should have reference to the separation and discharge of the concrete exudation, and the removal of spasmodic symptoms — to the fulfilment of the *second* and *third intentions* proposed. Bleeding, even if the state of the patient would admit of it, would not promote these intentions; and the exhibition of calomel or mercurials, excepting with the view of promoting all the abdominal secretions and excretions, and thereby to derive from the diseased organ, would not materially assist our views, inasmuch as it is impossible thereby to affect the system of children so as to prevent the formation of coagulable

lymph. In this case, we should assist the operations of nature in detaching the false membrane. It has been stated, that this is accomplished by the effusion, by the excited follicles, of a fluid matter between the concrete substance and the mucous coat; therefore those medicines which have usually the effect of increasing and rendering more fluid the mucous secretion of the air-passages, should now be prescribed. But care should be taken not to exhibit these, or any other *expectorants*, too early, or until depletion has been carried sufficiently far. They are most serviceable about the termination of the second, and the commencement of the third stage. The medicines best calculated to act as expectorants in this disease are, the preparations of *squills*, of *ammoniacum*, of *senega*, the *sub-carbonates* and the *sulphurets* of the *alkalies*, and *camphor*. The oxymel or syrup of *squills* may be given, either alone, or with some one of the sulphurets, or with senega, and generally to the extent of keeping up a slight nausea, unless the exacerbations of cough and suffocation be severe, when full vomiting should be produced by their means. I prefer the emetic effect at this period to be obtained by squills; as antimony lowers too quickly the vital power, which ought now to be supported, so as to enable the diseased organ to throw off the morbid matter formed upon its surface. A mixture, consisting of decoction of senega, with vinum ipecacuanhæ and oxymel of squills, may also be adopted with equal advantage. When the medicines fail of exciting vomiting, the pharynx should be irritated by a feather. I have seen very much benefit derived from this simple means; and have considered it more beneficial than any other, in the third stage, in promoting the discharge of matters from the trachea. Jurine also places great reliance on it. When severe exacerbations, with spasm and threatened suffocation, occur, it is always most advantageous to produce instant vomiting. The sulphate of zinc has been advised by M. Guersent, and the sulphate of copper by Dr. Hoffmann, for this purpose.

48. During this and the preceding stages, the *inhalation* of watery and medicated vapours may be resorted to. At the commencement of the disease, vapours of an emollient kind are most beneficial; but when we wish to promote expectoration, camphor may be added to the substance used in this way. Home, Crawford, Pearson, Rosen, Pinel, and Goelis, have approved of this practice. When spasmodic symptoms manifest themselves, inhalation, assisted by the *tepid* or warm bath, is often of use; but antispasmodics should also be prescribed with the other medicines, or in enemata. I have never seen any permanent advantage derived from narcotics given by the mouth, except from *opium* or syrup of poppies, combined with antispasmodics; probably owing to their lowering the vital energies, which are always much depressed when nervous symptoms appear. Great care should be always taken in exhibiting *opiates* in clysters to children: in very young children the practice is attended by much risk. Opiates are given to greatest advantage with ipecacuanha, as in Dover's powder, or with camphor or calomel, or with both. I have likewise found camphor, with James's powder and hyoscyamus, of much benefit in some cases in which I have prescribed it. The *hydrosulphuret* of *ammonia* may likewise be tried, in both this and the next stage of the disease.

49. In many cases, the judicious use of blood-letting, calomel, antimony, &c. will cut short the disease, even although the patient may not have been treated until this period has been far advanced; and in others, the active use of these means may give rise to very alarming depression of the vital energies, even when they may have succeeded in removing the cause of obstruction and irritation in the air-passages. In these, stimulants, antispasmodics, and restoratives must be immediately resorted to, but with great caution, lest the inflammatory action be reproduced by their means.*

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* The following case will illustrate the above observation, and may prove instructive to the less experienced reader. I have extracted it *verbatim* from my note-book, with the remarks suggested at the time appended to it: —

William Hodson, aged five years and a half, was seized, on the 17th of Nov. 1821, with hoarseness, fever, and a ringing, dry cough. The mother opened its bowels with salts, and gave it some antimonial wine. The following day, in the evening (18th), I saw it. There was much fever, with flushed countenance, and a constant, hard, and ringing cough, with a sibilous noise on respiration. Pulse frequent and hard; skin harsh and dry; great restlessness, tossing, dyspnœa, with hoarseness, and the characteristic breathing of croup. I directed blood-letting from a vein in the arm; and the blood was allowed to flow in a full stream till approaching syncope was indicated, seven ounces being abstracted; and the following powders were directed to be taken every ten minutes, till full vomiting; and subsequently every three hours: —

No. 162. ℞ Hydrarg. Submur. gr. xxx.; Antimon. Tart. gr. iij.; Ipecacuanhæ gr. vj. Misce benè, et divide in Pulv. viij.

Early in the morning of the 19th I again saw the child. The powders had been given, as above, until full vomiting had been produced; and one powder had been taken subsequently. The sense of suffocation had disappeared after the vomiting. The matters ejected contained much thick, ropy mucus, with membranous shreds of firm coagulated lymph floating in it. The cough and croupy symptoms had disappeared; the voice was clear, and the respiration easy: but now the child complained of distressing sickness, with frequent vomiting and purging: the stools were first bilious, offensive, copious, and fæculent; but they had now become watery. The pulse was extremely frequent, so as scarcely to be counted; and so small and thready as hardly to be felt at the wrist. The countenance was pale and sunk; the skin cool and moist; and all the symptoms of sinking of the powers of life very manifest. The powders were discontinued, and the following mixture directed: —

No. 163. ℞ Aq. Cinnam. ℥ iijss.; Spirit. Ammon. Arom. ʒ jss.; Tinct. Opii ♏ xv.; Syrup. Scillæ ʒ iij. M.

Two teaspoonsful of this were to be taken every ten or fifteen minutes, until a decided effect from it was evident. After four or five doses, the stools and sickness were restrained, and the child fell into an easy and sound sleep.

A blister was now applied to the sternum, which was to be removed at the end of four hours, and poulticed with a bread-and-water poultice. The semicupium to be employed afterwards, and at bed-time. Three grains of calomel, with one of James's powder, to be taken at night; and the mist. camphoræ, with liq. ammon. acet., vini ipecacuanhæ, and syrup. papaveris, every three hours. Linseed tea, or barley water, with sugar-candy or liquorice, for common drink.

20th.— All the symptoms of croup had disappeared; but there was still some cough and fever, with occasional paroxysms of difficult breathing. The bowels had been open this morning; pulse 120, and small. Antimonial wine was added to the mixture; and an injection directed, with assafœtida, spiritus terebinthinæ, oleum ricini, and camphor.

In the evening.— He had had no return of the paroxysms since the injection, which was retained above an hour, and had procured two evacuations. Pulse 116; cough less frequent; skin more natural. The blistered surface had risen in some parts, and was inflamed in all.

From this time he continued to recover: diaphoretics, demulcents, aperients, and the semicupium, being employed until convalescence was complete.

Remarks.—It is by no means unusual to find a recurrence of the inflammatory and local symptoms, after they have been apparently most completely subdued by means similar to those employed in the foregoing case; and even after the powers of life, and all local inflammation and febrile ac-

50. *c. The treatment of the third stage*, either when the patient has not been earlier seen, or when previous measures have failed, should be directed with the view of fulfilling the *second* and *third* indications of cure, and at the same time with due reference to the *fourth*—the preservation of the exhausted nervous and vital powers. The chances of recovery are now very few; but these few should not be neglected. Many of the remedies already mentioned, especially *expectorants*, should also be exhibited in this stage; and these ought occasionally—particularly when the symptoms become very urgent—to be given so as to exert a speedy emetic action; and be combined with *antispasmodics*—with either camphor, ammonia, æther, musk, valerian, assafœtida, the oxide of zinc or bismuth, the sulphurets of the alkalies, &c.; and the same medicines, or the infusion of valerian, may also be prescribed in enemata, especially when spasmodic or nervous symptoms are predominant. When *emetics* are required in this stage, those substances which are exhibited in smaller doses in the remissions, in order to act as nauseants or expectorants, are amongst the most eligible—particularly squills, senega, the sulphate of zinc. The *inhalation* of the vapour of ammonia, camphor, or æther, in that of warm water; or of the fumes of warm vinegar, either alone, or with camphor; is sometimes productive of benefit in this period. Some advantage may also be derived from *sternutatories* blown into the nostrils, as advised by Lentin and Thilenius. I have seen, in two or three instances, the sneezing occasioned by them favour remarkably the discharge of the false membranes from the trachea; common Scotch snuff having been used for this purpose.

51. The *tepid bath* may be resorted to both in this and the preceding stage, once or twice daily, or according to circumstances; and either the sulphuret of potash, or the sub-carbonates of potash or soda, may be put in the water; and, if a tendency to collapse becomes apparent, the bath should be *warm*, and some mustard may also be added. *Blisters* between the shoulders, or on the sternum, may likewise be tried; but they always require great discrimination and care, in order to avoid unpleasant consequences from them. They should not, in this stage, remain on longer than from four to eight hours. Home and Thilenius advise them to be applied to the neck; Lentin and Goelis, to the neck and sternum; and Royer-Collard, between the shoulders or on the arms; Maercker states, that he has derived but little benefit from them. Olbers and Royer-Collard speak favourably of sinapisms placed on the lower extremities. I have, however, seen more advantage accrue from rubefacient liniments (F. 299. 304.) or epithems, applied on the epigastrium and chest, or between the shoulders. During this, as well as the preceding stage, a *cathartic* action should be exerted upon the bowels, unless the medicines previously exhibited occasion diarrhœa, or dysenteric symptoms. Medicines of this description are beneficial, as active derivatives from the seat of disease, and as evacuants of morbid secretions. Calomel, with jalap, may be given, either alone, with musk, or some other antispasmodic medicine; but, in every instance, the occasional exhibition of an enema should not be neglected. Olbers, Albers, and Jurine, strenuously advise large doses of *musk* to be exhibited; and Kendrick and Royer-Collard, *assafœtida* to be administered in clysters. The *affusion of cold water* on the head has been sometimes resorted to by Harders, Schmidt, and myself, when the preceding means have failed, particularly if congestion or other cerebral symptoms have supervened, and the exacerbations have assumed chiefly a spasmodic form.

52. *B. Treatment of the humid and spasmodic Forms of Croup.*—*a.* In the *humid or bronchial form* of the disease, the intentions of cure are,—1st, to subdue inflammatory action; 2d, to remove the matters exuded from the air-passages; 3d, to calm spasmodic action; and, 4th, to support vital power. These can be attained only by *bleeding*, general or local, as already advised, but never from the throat itself; in the early stages by antimonial *emetics*, and subsequently by those consisting of ipecacuanha or sulphate of zinc; by *calomel*, with James's powder, as prescribed above, and afterwards with other *purgatives*, as scammony or jalap; by *cathartic* enemata; by *external derivatives*; and, lastly, by *antispasmodics* and *diffusible stimulants*. Of these, individually, little need be added to what has been already advanced. More advantage seems to be derived from *purgatives*, in this, than in any other form of the disease. I have sometimes seen them bring away a thick, gelatinous, glairy secretion, similar to that discharged from the air-passages in the advanced stages. Their operation should be promoted by the administration of purgatives in antispasmodic clysters, as extract of colocynth with assæfœtida, valerian, or camphor; and if spasmodic symptoms become urgent, the sulphurets or sub-carbonates of the alkalies, and either of the various antispasmodics already mentioned, may also be taken by the mouth, particularly camphor, with James's powder, or Kermes mineral, or ipecacuanha, with spirits of nitre, æther, or other diaphoretics. The medicated *tepid* or moderately *warm bath*, *blisters*, rubefacient *liniments*, the *inhalation* of simple or medicated vapours, may also be resorted to in the manner detailed above. In the last stage, when the powers of life indicate exhaustion, ammoniacum, senega, oxymel of squills; and camphor, assafœtida, musk, ammonia, the æthers, &c. in full doses; and rubefacient and stimulating frictions, liniments, and baths, with the rest of the treatment already recommended at this period; are the chief means in which we can confide.

53. *b.* In the *spasmodic form* of the malady, the indications of cure are very nearly the same as now stated; but the treatment will necessarily vary with the extent to which inflammatory

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tion, had been equally depressed. This recurrence of the acute symptoms seems owing to either an over active use of stimulants, or an injudicious choice of them in the collapse occasionally following the decided use of blood-letting and antimony. Sometimes it arises from exposure to cold, or a current of cold dry air; and then, generally, a distinct chilliness or rigor is previously felt. Occasionally I have traced it to a too early recourse to food, or articles of a too stimulating and indigestible description. Inattention to the state of the bowels will also dispose to it; and even a blister applied too near upon the seat of disease has evidently produced such an effect, especially in thin irritable children. In no case would I permit a blister to be placed upon the throat, so firmly am I persuaded that mischief is occasioned from it in this situation.

irritation may be supposed to exist either in or about the larynx, particularly soon after the appearance of the disease; or about the medulla oblongata, in its more advanced course. In that state of constitution in which this form is most frequent, bleeding is seldom required beyond that procured by a few leeches applied to the nape of the neck, when we infer the presence of inflammatory irritation in the above situations. In this modification, whether occurring primarily, or in relapses, *antispasmodics*, given both by the mouth and by clysters, are indispensable; but *emetics*, and afterwards *cathartics*, medicated *tepid* or *warm baths*, and *inhalations*, *blisters*, or *rubefacient* frictions and liniments along the spine and over the epigastrium, and the *cold affusion* on the head, also constitute important parts of the treatment. The antispasmodics most to be confided in, are, the sulphurets and sub-carbonates of the alkalies, valerian, assafœtida, ammonia, camphor, musk, the preparations of æther, the oxides of zinc and bismuth, and the liquor ammoniæ acetatis, with excess of ammonia. Mr. Kimbell states, that he has derived most advantage from the internal use of arsenic, or sulphuret of potass, aided by regular attention to the bowels, the shower bath, and by blisters or anodyne frictions on the spine. Of arsenic I have had no experience in this affection; but I have given the preparations of bark, and used the other remedies he has mentioned, with advantage. If the above means do not soon remove the disease, irritation about the base of the brain or medulla oblongata should be suspected, and leeches ought to be applied on the neck; and calomel, with aperients, or with musk or camphor, exhibited once or twice daily, injections being also employed: cerebral symptoms should be always enquired after, and energetically treated when detected.

54. *C. Treatment of complicated and consecutive Croup.* — The treatment of the various complications of the disease must be directed according to the general principles now sketched; and with strict reference to the nature of the associated malady, to the period of the primary disease at which it appeared, to the characters of the attendant constitutional disturbance, and of the prevailing epidemic, and to the well-ascertained fact that local inflammations supervening in the course of continued or eruptive fevers, although they require depletions, do not admit of them to the same extent as those which occur primarily.

55. *a.* The association of croup with *inflammation of the throat*, and exudation of lymph in this situation, whether originating in the *pharynx*, which is rarely the case, or extending thither and to the air-passages from the fauces and tonsils, is one of the most frequent forms in which the disease presents itself, particularly when epidemic or infectious, and is, therefore, deserving of particular notice. But the treatment must, in a great measure, depend upon the degree in which either sthenic or asthenic inflammatory action and fever may be considered to exist. Although great increase of vascular action is present at the onset, in the majority of such cases; yet it is often attended by deficient vital power, and exhaustion soon takes place. Even in the most sthenic cases, the treatment which would have been of service at first, is soon no longer admissible; whilst in other cases, and in some epidemics, very marked adynamia is manifested from the commencement. Much depends on the precision with which the exact nature of the case and the state of vital power are ascertained, and on having early recourse to judicious measures. As to the predominance of either of the states of morbid action alluded to, the frequency and tone of the pulse, the colour of the exudation in the throat, and of the parts surrounding it, and the continuance of the disease, are the chief guides. If the inflammation and exudation commence in the tonsils and spread downwards, if the exudation be of a light colour, and the inflamed parts of a lively hue, the pulse being strong, full, and not very quick, depletions, general or local, the use of emetics and nauseants, and the rest of the antiphlogistic treatment, are required; but the further the disease departs from these characters, the darker and dirtier the exudations appear, the more livid and deeper the colour of the inflamed parts, the quicker, softer, and weaker the pulse, the more should antiphlogistic measures be relinquished, unless in some cases to a moderate extent, and at the very commencement of the complaint; and the more ought we to have recourse to camphor, ammonia, the decoction of senega, ammoniacum, &c.

56. *b.* The nearer the complicated disease, in its local and constitutional manifestations, approaches to the *malignant form*, the more extreme is the danger, and the greater necessity is there for the exhibition of tonics and stimulants. In such cases, the decoction of senega, the infusion of serpentaria, or mixture of ammoniacum, may be prescribed, with camphor, and any of the compound spirits of ammonia; or the decoction of bark, with liq. ammon. acetatis and tincture of capsicum; or the sulphate of quinine, with infusion of roses, and the æthers; or either the chlorate of potassa, or the muriate or carbonate of ammonia, with camphor, musk, myrrh, assafœtida, &c. in suitable vehicles. When the paroxysms of suffocation become urgent, senega, preparations of squills, or F. 402., may be given in doses sufficient to produce vomiting, and repeated according to circumstances; and active stimulant and antispasmodic clysters be thrown up. The vapour of camphor and warm vinegar may also be employed, and various stimulating and aromatic fumigations resorted to. The mouth and throat should be frequently gargled, or washed, by means of a sponge fixed to the end of a piece of whalebone, with a solution of the chlorurets, or of the sub-borate of soda in camphor mixture; or with a weak solution of nitrate of silver, — a scruple to an ounce of distilled water, — as first advised by Mr. Mackenzie; or with Goulard water, as suggested by Dr. Hamilton; or with the chloric acid or chlorine in decoction of bark, or other stimulating detergents; and sinapisms or embrocations with Cayenne pepper, or rubefacient liniments (F. 300. *et cet.*), may be applied on the nape of the neck, or on the lower part of the chest, and on the epigastrium. In the complications of the disease with angina maligna, observed by Loeffler and Bretonneau, powdered alum was directed by them to be blown into the throat; and various other astringent and antiseptic powders may be employed in the same manner. When the characteristic eruption of scarlatina accompanies the affection of the throat and air-passages, the treat-

ment must be directed according to the same principles. In all cases of angina, attended with membranous exudation, whether the attendant constitutional disturbance present sthenic or asthenic characters, the local treatment advised by Mr. MACKENZIE should be adopted upon the appearance of the exudation on the tonsils or fauces, and a large blister should be applied early, as being the most efficacious means of preventing the extension of this form of inflammation to the pharynx, air-passages, or œsophagus.

57. *c.* The treatment of the *complications with aphthæ*, or *with any of the eruptive fevers*, will depend, as much as the foregoing, upon the state of vital power characterising the constitutional affection. The appearance of croupal symptoms in the course of small-pox — particularly confluent small-pox — will require nearly the same medicines as have now been recommended (§ 56.); and the washes advised to be applied to the mouth and throat will be equally serviceable in the *aphthous*, as in the *variolous* complication. When croup is consequent upon either *measles*, or *hooping cough*, vascular depletion is more frequently required than in almost any other complication, excepting that with inflammation of the throat of a sthenic kind, whether attended by albuminous exudation or not.

58. *D. The affections consequent upon croup* — or the states of disease which it excites, or into which it passes — require not only appropriate remedies, but also the application of them with strict reference to the primary malady, and the means by which it was combated. When it runs on to *brouchitis*, the latter affection commonly assumes the asthenic form, generally terminates fatally, and requires the treatment described in the art. BRONCHITIS (§ 70. *et seq.*). Its passage into *pneumonia* is attended with similar results; and depletions, unless they have been previously neglected, are not well borne. When *diarrhœa* or *dysenteric* symptoms are produced, in the latter stages, by the means used to remove the disease, we shall generally find the preparations of *opium*, and the warm bath, as hereafter to be noticed, of much benefit. A considerable number of cases, particularly those complicated with sore throat, terminate in *sinking*, or *exhaustion* of vital power, and not by suffocation. This circumstance should be kept in view in the treatment of the last stage; and its earliest indications be met with suitable stimulants and tonics (§ 56.). In cases presenting *imminent suffocation*, the question of *tracheotomy* should be entertained; but at the same time, with the recollection, that either exhausted vital power, the extension of disease to the bronchi, and the accumulation of viscid or concrete exudations in them, or inflammatory action, or emphysema of the lungs themselves, may tend individually, or in combination, to prevent the success of the operation, independently of the immediate contingencies to which it is liable. (See § 74.)*

59. REMARKS ON VARIOUS REMEDIES ADVISED, AND ON THE OPINIONS OF AUTHORS RESPECTING THEM. — *a. Nauseants* and *emetics.* In the first stage of the disease, and in the commencement of the second, I have sometimes found that *tartar emetic*, given so as to produce and prolong a state of *nausea*, has so completely relieved the croupal symptoms as to prevent altogether the necessity of having recourse to blood-letting; and that in other, and more severe cases, the same medicine, exhibited so as to produce vomiting, and to continue the nauseating effect for some time afterwards, and thereby to prevent reaction supervening upon the emetic operation, has been followed by a similar result. *Emetics* have been much recommended after blood-letting, and the inhalation of vapour, and when the exudation is presumed to begin to loosen, by HOME, LENTIN, DARWIN, MAERCKER, PORTAL, SMITH, HECKER, VIEUSSEUX, RUMSEY, &c. When the patient has not been visited sufficiently early, this plan is certainly judicious. But when he is seen in the first stage, it will be better to attempt to prevent the formation of the false membrane, by exhibiting *nauseants* or *emetics* instantly, as now advised, and, unless the inflammatory symptoms are very severe, before having recourse to blood-letting. This early exhibition of emetics is sanctioned by CRAWFORD, CHEYNE, PINEL, HOSACK, THOMPSON, HUFELAND, ALBERS, SCHWILGUE, &c. Dr. GAISLER prescribes, on the invasion of the disease, tartarised antimony and oxymel of colchicum. Whilst vascular excitement continues, either this combination, or the antimony only, in repeated doses, as suggested by CHEYNE and MICHAËLIS, is the best emetic; but when we wish to detach the membranous exudation, the preparations of squills, alone, or with ipecacuanha, are preferable. In the more spasmodic form of the disease, ipecacuanha, as GOELIS remarks, is as suitable an emetic as can be adopted: but when it is found necessary to exhibit such a medicine in the last stage of the disease, or when it is associated with angina maligna, or attended by symptoms of depressed vital power, senega, squills, or the sulphate of zinc, given with stimulants and antispasmodics, or F. 402., are to be preferred. GOELIS recommends emetics in the first stage of the least inflammatory forms, and generally in the third

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* I may here adduce a summary of the practice adopted by the most experienced physician in France in this disease — the senior physician to the Hospital for Children in Paris. It will be seen how closely it agrees with my own, in a similar Institution in London: —

M. JADELOT considers croup as a kind of angina of the air-passage; presenting more violent symptoms, and having true paroxysms, separated by well-marked intermissions of a special character. He admits different degrees of the disease, without changing its nature. Bleeding by leeches, and emetics, are the agents he most frequently employs in its treatment. Emetics alone have often sufficed to stop the disease, especially in weak, pale, or bloated subjects; but, in opposite cases, he insists on the application of leeches, and allows the blood to flow until the child becomes pale, and the pulse loses its strength. After the bleeding, he causes vomiting, several times in succession, at intervals of two or three hours; and the practice is attended by the greatest success, relief being very apparent after each vomit.

When the croup has arrived at the second period, without having been opposed, and the presence of a false membrane is suspected, M. J. directs leeches to be applied; but, the moment they fall off, he hastens to produce vomiting: and it is in this case that he employs, by spoonsful, every ten minutes or quarter of an hour, the mixture called anticroupal*, until full vomiting is produced. He insists, also, upon the use of errhines, and of derivatives applied to the skin and intestinal canal.

When the disease is very rapid, it has been a question whether or no we should commence by bleeding, or by an emetic. M. J.'s opinion is, that we should first bleed, if the child be robust, and if it present signs of congestion towards the superior parts: on the contrary, he would commence by vomiting, when the subject is pale and exhausted, and there is little heat or fever. (RATIER's *Medical Guide, &c.*)

* ℞ Infusi Polygalæ ℥iv.; Syrup. Ipecacuanhæ ℥j.; Oxymel. Scillæ ℥iij.; Antimon. Tart. gr. jss. Misce.

stage; but he prohibits them in the second or inflammatory stage, and when suffocation is threatened towards the close of the disease. When, however, tartarised antimony is employed, and nausea is kept up in the intervals between the emetic operation, as I have recommended above, bleeding being also employed, the reaction dreaded by this experienced writer will not come on. His objections to an emetic in the paroxysms of suffocation occurring towards the close of the malady, may be well founded, were antimony or even ipecacuanha to be then prescribed; but, when zinc, squills, and senega are conjoined with stimulants and antispasmodics, and their operation accelerated by irritating the pharynx, I have seen the air-passages thereby freed from the substances obstructing them, and the patient saved.

60. *β. Bleeding,* general or local, or both, although indispensably requisite in the great majority of cases, is not always of service. Rumsey and Huggens remarked its injurious effects in the complicated cases they treated; and the more nearly the disease approaches to the spasmodic, and the febrile symptoms to the adynamic character, particularly in the complications, the more likely is it to be of little benefit, or even injurious, unless the state of action and habit of body evidently requires it. In the more inflammatory states, it should be promptly and fully performed; the use of nauseating medicines generally preventing the necessity of having recourse to very large or injurious depletions. Ghisi, Home, Crawford, Rosen, and others, have preferred general blood-letting at the commencement; and Bayley, Middleton, Balfour, and numerous writers, have recommended the jugular vein to be chosen. Treber, Hirschfield, Werner, Goelis, and Malfatti, very experienced physicians in Vienna, employ local depletions, excepting in the most inflammatory cases; and I agree with them, differing only in preferring cupping to leeches. As to the *period* at which it should be resorted to, I believe, with Goelis, that little will be gained by resorting to it before inflammatory action is manifested, or after excitement has subsided. A suppressed and apparently weak pulse, early in the disease, is often rendered full and hard by venæsection, and a repetition of the operation required, — a circumstance evincing the importance of interpreting aright the state of the circulation. Of forty-seven cases treated by Goelis, in 1808, seven were blooded from a vein; thirty-four by leeches only; and six were not blooded at all. The average quantity of blood that I have found requisite to take, altogether, as nearly as I can calculate, is about five ounces in children of three years, seven or eight in those of five or six, and about ten ounces in those from ten to twelve. This result relates chiefly to those not seen until the second stage of the more inflammatory or common forms of croup. I have met with cases in which blood-letting had been chiefly confided in, and been carried to the utmost extent; but it certainly had seldom or ever cured the disease, when thus employed, and even sometimes had been evidently injurious. The celebrated Washington was said to have died of croup. He lost, at the age of sixty-eight, about ninety ounces of blood in twelve hours. An attentive perusal of the cases published by Dr. S. Jackson (*Amer. Journ. of Med. Sciences,* vol. iv. p. 361.) will show the inefficiency and injurious effects of excessive depletions.

61. *γ. Calomel and mercurial inunction* have been most strenuously recommended, the former especially, since it was first prescribed by Rush, and in larger doses by Stearns, Marcus, Autenreith, Anderson, J. P. Frank, Neumann, Michaëlis, and others, who gave it every three or four hours. Hamilton directs it, in full doses, every hour or two hours at first, and subsequently at longer intervals; Hecker advises it in small doses; and Wigand states that it is of no use. Cheyne prescribes it with James's powder; Harles and others, with the officinal preparations of antimony; Schæffer, with emetics and musk; Schluter, with oxyde of zinc and other antispasmodics; Michaëlis and Neumann, with expectorants; Archer, Marcus, and Hufeland, with decoction of senega, and mercurial inunction about the neck; and Augustin, with opium. In the stages attended by excitement, it is best conjoined with James's powder or tartarised antimony, as prescribed above; and sometimes with opium, or Dover's powder, and subsequently, if it be given at all, with purgatives; expectorants, antispasmodics, &c. being exhibited in the intervals. Goelis conceives that it is useful in diminishing the tenacity of the croupal exudation, and in retarding its formation. He moreover supposes, that the daily exhibition of a small dose of this medicine subdues the diathesis, or constitutional disposition to contract the disease; and when croup has been prevalent, and appeared in one of a family, he has given about a grain at bed-time daily to each of the other children.

62. *δ. Blisters and counter-irritants* have been already mentioned; but there are certain points, particularly as respects the period and manner in which they ought to be employed, that require to be noticed. There are very few writers who have not recommended blisters in croup, but quite as few have done so with the wished for precision. On this subject Goelis is more practically minute than any other writer; and in many respects his experience coincides with my own. I believe that most advantage will be derived from as early an application of a large blister as is consistent with the previous employment of blood-letting. Directly after the first depletion, therefore, one should be applied in either of the situations advised (§ 46.); a piece of fine tissue paper being placed between it and the skin. It ought to be removed upon the appearance of redness of the cuticle, and a warm bread and water poultice placed over the part, and frequently renewed. If blisters be used in the latter stages, they should be watched with great care, and be allowed to remain for a few hours only, and not a minute after slight redness is produced. I believe that the dangerous effects sometimes occasioned by them are owing to the want of these precautions, and to having recourse to them at a time when the vitality of superficial parts is soon exhausted, owing to vital depression and to deficiency of blood, consequent upon excessive depletion. The liberal use of calomel, particularly when it has not been carried off by purgatives, may also, by increasing the irritability of the tissues, dispose to unfavourable results from blisters. If prescribed at all, they should be of full size; they ought never to be applied over the

throat, as recommended by some writers; and, in very young and delicate children, it will be better not to place them over leech-bites. In the latter periods, I prefer to blisters, the use of warm poultices, on the surfaces of which Cayenne pepper and scraped camphor are sprinkled in quantity sufficient to produce redness of the cuticle; or the application of warm cloths, moistened with either of the liniments, F. 300. 307, 308. These are particularly useful upon the removal of the patient from a warm bath, especially in the complications of the disease. *Sinapisms* have been directed by many to be applied to the extremities; but I have seen more harm than benefit produced by them, from the distress and crying they occasioned.

63. ε. *Internal and external emollients* are sometimes useful auxiliaries, particularly in the first stage. The decoctum althææ, the mist. amygdal. dulcis, the inspissated juice of the sambucus niger, mucilages, with liquor ammoniæ acetatis, vinum ipecacuanhæ, and syrup (see F. 47. 389.), may be used internally; whilst warm fomentations, with decoction of camomile flowers and poppy-heads, are applied about the throat, and frequently renewed, upon the occurrence of hoarseness, cough, and difficult respiration. These have the effect of retarding the approach of the latter and more dangerous states of the malady, even when they fail of rendering more efficient aid. Lentin advises camphor to be applied to the chest; but it will be more beneficial to employ it along with the fomentations, which may extend over both the throat and the upper part of the chest; or it may be placed upon warm poultices, as advised above, particularly in the more spasmodic and complicated states of the disease.

64. ζ. *Cold epithems* on the throat have been employed by some writers, and particularly by Field. They appear to have been of little service in his cases. I am unable to give any opinion respecting them from my own experience. They seem not to be equal to warm fomentations. Goelis states, that they are dangerous means to resort to; and alludes to cases where they were injurious.

65. η. *Semicupium and pediluvium* are useful modes of derivation, in the first and second stages especially. But salt, mustard, and, in some cases, a little of either of the fixed alkalies, or of the sulphurets, should be added to the water, and its temperature gradually increased as immersion is prolonged. Great care is requisite in removing the patient from the bath, to prevent any chill. In many cases, it will be preferable to wring as dry as possible large pieces of flannel out of warm water prepared as above, and to wrap them round the lower limbs of the patient, changing them frequently, or prolonging the use of them, according to circumstances, and preserving the bed-clothes from moisture.

66. ϑ. *Tepid and warm bathing* are of service — the former in the early stages, the latter in the advanced periods, of the disease. Goelis advises the tepid bath of about 23° or 24° of Reaum.; and to be rendered antispasmodic by using a decoction of chamomile flowers and poppy-heads; or irritant, by adding some caustic alkali; or both antispasmodic and derivative, by a combination of these substances, according to the circumstances of the case. I have, in a few instances, used these baths, upon the recommendation of this writer, and certainly with marked advantage, but I have increased their temperature in the latter stages of the disease, rendering them, at the same time, more irritating by the addition of an alkali. In the early periods, however, the emollient and antispasmodic form of bath seems preferable, particularly when the patient breathes the vapour rising from it. The *duration* of immersion should seldom be shorter than twenty minutes, unless circumstances should prevent it; and I am convinced that it may be prolonged to two hours, with advantage, in some instances. In a case despaired of, I caused, upon the recommendation of Goelis, the child to be put in a bath consisting of a decoction of chamomile flowers and poppies, to which some caustic alkali was added. It was kept there for twenty-five, and on a second occasion forty, minutes. It ultimately recovered. Care must be taken that the temperature of the bath does not fall during its continuance. As soon as the patient is removed, and the skin dried, he should be placed in warm flannel, or in a blanket; and perspiration encouraged by diaphoretics suited to the nature of the case and stage of the disease: in the early stage by antimony or ipecacuanha, so as to excite slight nausea, or occasionally vomiting, if requisite; in the latter periods, with liquor ammoniæ acetatis, given in sufficient quantity to produce the same effects; or, if sinking be apprehended, with camphor, ammonia, &c.

67. ι. *Purgatives* have been given with different intentions; — either as mere evacuants of retained secretions and excretions; or as active derivatives from the seat of disease. Home, Desessartz, and Michaëlis, seem to have resorted to them with the former intention; Hamilton, Pinel, and Autenreith, with the latter view; Crawford, Thompson, and others, prescribing also enemata. My own experience is decidedly in favour of this class of medicines; and of employing calomel, jalap, scammony, &c., and extract of colocynth, with assafœtida, &c. in enemata (§ 51, 52.).

68. *Sudorifics* are of use only in the early periods of croup. James's powder, and the other preparations of antimony, subsequently ipecacuanha, and liquor ammoniæ acetatis, or the one combined with the other, and given to the extent of exciting nausea, in conjunction with emollients (§ 63.), are important auxiliaries. Goelis remarks, that Dover's powder is seldom productive of any benefit; and that sudorifics are never of service in the last stages. Gentle *diaphoresis*, early in the disease, is undoubtedly beneficial, when the patient drinks freely of emollients; but he with justice adds, that very copious sweats only increase the disposition to form false membranes of a firm and adherent kind, owing to the evacuation of too large a proportion of the watery parts of the blood. In these opinions, Treber, Hirschfield, and most of the Vienna physicians, agree.

69. κ. *Expectorants.* — Under this head may be ranked an important part of the remedies prescribed in croup. The *inhalation* of vapours has already been noticed. The experienced Goelis places much confidence in them during the first and third stages; in the latter of which they often increase the cough, but they favour the discharge of false membranes, by increasing the mucous secretion by aid of which they are thrown off.

have mentioned (§ 47.) the expectorants in which my experience has led me to confide. There are very few which have been more generally recommended than *senega*. Archer, Barker, Valentin, Royer-Collard, Lentin, Maercker, Carron, &c. recommend it after bleeding. Dr. Archer, who attributes the greatest virtues to this medicine, advises it to be given at the same time as calomel, in frequent doses, until it excites vomiting or purging. Goelis and Treber remark, that, although a good remedy in the third stage, it is by no means possessed of those specific virtues attributed to it by Dr. Archer; and in this I agree with them. It is a useful medicine in the complications of the disease with malignant sore-throat or scarlatina. *Squills* are chiefly trusted to by Hufeland, Rumsey, and Maercker, in the latter periods. They should not be exhibited in the more inflammatory states of the malady, until after depletions have been carried sufficiently far, and we wish to procure the expulsion of the concrete exudations formed in the air-passages. They ought to be exhibited in small doses in the remissions, and pushed to the extent of producing vomiting when paroxysms of suffocation occur. After the membranous substances are removed, squills should be altogether laid aside. The *sulphuret of potash* has been recommended by Professors Serf, Chaussier, Mercier, and Hecker, in doses of about four grains, given every three or four hours. It is sometimes of much service after depletions. It may be combined with camphor, or small doses of ipecacuanha.

70. λ. *Antispasmodics* have been very generally prescribed, and particularly by Michaëlis, Pinel, Schwilgue, Vieusseux, &c., after the decided use of antiphlogistic remedies. Home, Cheyne, and Goelis, consider that these medicines are of little use in common and inflammatory croup. I am, however, convinced, from extensive experience, that, when the inflammatory symptoms are altogether, or even nearly, removed by antiphlogistic medicines, when the disease passes into a spasmodic state, or presents from the commencement a predominance of such symptoms, and when increased irritability becomes manifest, a judicious exhibition of antispasmodic medicines is often attended with benefit. *Musk*, either alone or with other medicines, with calomel (Michaëlis and Wigand), with squills, sulphuret of potash, or other expectorants, and with camphor or ammonia, in the last stage of the malady*; *valerian* and its preparations, and *assafœtida*, or any of the other medicines of this class mentioned above, may be employed, either alone, or with expectorants and opiates, particularly when the energies of the system begin to be depressed, or the complaint assumes from the first a spasmodic character.

71. Of those medicines which are *antispasmodic* from their *sedative* operation, the most important are colchicum, opium, hyoscyamus, prussic acid, digitalis, and tobacco. *Colchicum* may be given combined with calomel, in the early and inflammatory states of the disease, or with ammonia or camphor, at a later period; but it ought, in young children especially, to be exhibited with extreme caution, — in very small doses, and carefully watched. It came into fashion in this and other diseases of the air-passages a few years since, and was, for a time, much employed; I then saw some cases of croup in which it had been very injuriously employed, from having been given in too large doses for the age of the child, or too long continued, or combined with other depriments, as antimony, &c., or exhibited after very large depletions. I can most truly assert, that I have seen at least two cases of croup, in which death was to be imputed to this substance, rather than to the effects of the disease; and yet it is sometimes of use when combined as I have now advised. Of *digitalis* I have had no experience in this complaint; if exhibited at all, it should be conjoined with calomel. *Prussic acid* has been employed in some cases which I have seen; but the same objections I have urged against colchicum apply to it, when prescribed for young children. In older patients it is sometimes of benefit, combined with camphor, or oxyde of zinc, or other stimulating antispasmodics, in combating the irritability and disposition to spasmodic paroxysms in the latter stages. *Opium* was much

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* The chief danger in croup often proceeds from the spasm with which the respiratory passage is affected in the progress of the disease. The obstruction of the tube by the false membrane and effused matter, seldom of itself causes suffocation; but rather this lesion, combined with spasm of the muscles of the larynx and membranous portion of the trachea; and, in many cases, exhaustion is superadded, or even constitutes the most important change. Depletions alone will not overcome this disposition to spasmodic action, which is generally observed to supervene at intervals; the periods elapsing between the paroxysms varying according to the strength and constitution of the child, and the severity of the disease. But, in many cases, the spasmodic action is more frequent and more dangerous, and the more likely to become associated with convulsions, the weaker the constitution and powers of life, and the more those powers have been reduced by copious depletions. After moderate depletion, therefore, and in many cases even previously to any, such medicines as possess an antispasmodic power, by first acting as nauseants, are of great benefit. M. Kimbell seems to have partly adopted this view of the disease and of its treatment; but I am confident he has carried it much too far. If his success has been equal to what he conceives it to have been, the cases which he has met with have been unusually slight. There is no doubt of bleeding, blistering, purging by calomel, &c. &c., having been pushed to hurtful lengths in many cases, or inappropriately applied; and the same may be said as to other means, which have tended more to exhaust the vital energies than to cure the disease: and there can be no doubt of the disposition to spasm becoming greater, and of its consequences being more to be dreaded, the lower the powers of life sink; for, with such sinking, the general sensibility and irritability of the frame increase. But I cannot conclude that those means could have been dispensed with in any considerable number of the cases which have fallen under my observation, and in which I have never omitted also to employ antispasmodics of the most active nature, from a conviction that the disease partly depends upon spasm. Mr. K.'s observations as to the treatment of the disease, are to the following effect: — "I never bleed or blister a child in croup: I have never thought it requisite to do so, since I have adopted the plan alluded to; although such auxiliary practice would be in no other respect incompatible, than as tending to invalidate the general strength. The treatment I allude to consists in confining the child to a uniform and rather warm temperature, giving an emetic of ipecacuanha, and, in an hour after, commencing the following mixture: —

No. 164. ℞ Pulv. Valerianæ ʒ ij.; Oxymel. Scillæ ℥j.; Tinct. Opii gtt. xx.; Aquæ Destillatæ ℥j. Misce.

I administer a teaspoonful every hour, if the child is from two to five years old; if from five to eight, every five and forty minutes, so as to maintain the anodyne effect of opium, and the sub-nauseant expectorant, antispasmodic effects of the squill and valerian, until the symptoms are removed; which commonly happens in ten or twelve hours, and which I have never seen protracted beyond eight and forty. On their subsidence, I have, in general, given a brisk dose of calomel and jalap."

Mr. K. likewise recommends the above treatment in hooping cough and in catarrh; and in those cases which are unconnected with inflammatory action, it is not inappropriate. In the slight and more spasmodic states of croup, it also will prove very beneficial.

employed, after depletions, by **KENDRICK** and **HUGGANS**. It may be used both externally and internally (as may the preparations of *morphine*), with aromatics, camphor, or assafœtida, musk, &c., in the states of the disease now mentioned. *Henbane*, and *extract of poppy*, may also be employed under similar circumstances and forms of combination. *Tobacco* has been prescribed in croup, in various modes. Dr. **VANDERBURGH** and Dr. **GODMAN** recommended a plaster covered with Scotch snuff to be applied across the top of the sternum; and myself and others have employed this substance, with the view of detaching the false membrane by exciting sneezing and an increased secretion of mucus. The *smoke* of tobacco has also been directed to be inhaled, in order to remove spasm, and promote expectoration, by its direct operation in the air-passages; and others have advised the patient to smoke a cigar, with the intention of producing nausea, as well as the other effects last enumerated. After depletion, and when the disease is about its acmé, the powers of life not being materially exhausted, a cautious use of this means may be serviceable. In the case of children who cannot use a cigar, the smoke of one may be blown around them, and in this way it will have a sufficient effect. Cloth moistened with an infusion of tobacco may, under some circumstances, be applied over the throat, and its effects carefully watched; but this measure is not without hazard, particularly after lowering remedies have been used, or in an advanced stage of the malady.

72. *μ*. The *preparations of ammonia* have been much employed in all the states of croup, *Caustic ammonia*, in doses of three or four drops, given every hour; ammoniacal liniments being at the same time applied about the throat; has been advised by some writers, in order to promote the excretion of the concrete exudations in the third stage of the disease. The *carbonate of ammonia* has been more generally employed. M. **RECHOU** prescribed it both internally, and externally in ointments to the throat. In the latter stages, as a useful antispasmodic stimulant, it may be sometimes of service; it is very advantageously combined with camphor, or even with calomel, in the complications of croup with angina maligna, or with any of the eruptive fevers. M. **CHAMERLAT** has recommended the *muriate of ammonia* to be taken internally, and applied to the fauces, when the disease is associated with inflammation of the throat. The *cuprum ammoniatum*, and the *hydrosulphuret of ammonia*, have also been prescribed in doses suitable to the age of the patient. They may be sometimes of service in the more spasmodic states; but I have had no experience of their effects in this complaint.

73. *ν*. M. **VALENTIN** has recommended the application of the *actual cautery* upon each side of the throat, in the most severe forms of the disease, when it is at its acmé. *Moxas* seem to be preferable to the actual cautery; and, if this practice should be adopted, it might, perhaps, be advantageous to follow it by fomentations placed over the trachea. M. **DUPUYTREN** employed in one case, referred to by **GUERSENT**, a small rod of whalebone covered by pieces of sponge, which was introduced into the pharynx in order to remove the partially separated portions of false membrane lodged, in that situation, or partly thrown out from the larynx. In the advanced stage of croup complicated with angina pharyngea, this contrivance is calculated to succeed.

74. *ξ*. *Tracheotomy.* — There does not seem to be a chance of success from this operation in any case wherein the treatment developed above has failed. The practitioner, however, may be called to a case so late in the disease, and where the suffocation is so imminent, that the propriety of having recourse to it may be admitted: but, even in these, the chances are infinitely greater against than in favour of its success; and if benefit can be obtained from any measure, it is as likely to accrue from the energetic exhibition of suitable emetics as from tracheotomy. Cases have doubtless been recorded of the success of the operation in croup; but these are so very few, compared to the number in which it has failed, that I perfectly agree with **GOELIS**, **CHEYNE**, **ROYER-COLLARD**, **PORTER**, **WOOD**, and many others, in concluding that it should seldom or never be attempted in this disease. Of the propriety of having recourse to it in certain states of laryngitis, &c. there can be no doubt; and it may, with some slight grounds of hope, be resorted to when croup is chiefly confined to the larynx and upper portion of the trachea; also, perhaps, in some cases of its consecutive occurrence upon inflammation of the throat with membranous exudation; and when we infer, from the general symptoms and the signs furnished by the stethoscope, that the bronchi and lungs are unaffected; but in that period of the simple as well as of most of the complicated forms of the disease, in which only it should be attempted, and when internal treatment has failed, I believe that the superinduced lesions in the bronchi, lungs, circulating fluid, and nervous system, are such as to preclude hopes of its success. Moreover, the feelings of the parents regarding it, and the reputation of the physician and operator, are not to be kept out of view. "Ad tracheotomiam," says **GOELIS**, "omnium remediorum incertissimum confugere res ardua est; parentes abhorrent, aversantur agnati et periclitatur medici fama, quem, infausta si fuerit operatio ac votis illudens, lacrymis multis velut homicidam prolis amatæ detestantur parentes."

75. ii. **PROPHYLACTIC TREATMENT**, &c. — *A.* **GOELIS** states, that he never saw a child with porrigo and other chronic cutaneous affections attacked by croup whilst they remained fully developed, even when this disease was most prevalent. He therefore advises the having recourse to any form of issue, when an attack is dreaded. To resort, however, to emetics, to antimonial medicines, to counter-irritants, to depletions, to confinement in-doors one half of the year, and other measures which have been advised, is attended with greater mischief than to allow the child to run the slight risk there is of his having the disease. The case, however, is different in respect of a child who has once suffered an attack. The liability of croup to recur, even several times, after intervals of various duration, renders precautions, under such circumstances, very requisite. The chief of such measures are — removal from the predisposing and exciting causes (§24—31.); change of air and locality; the use of the shower or cold bath every morning, the skin being well rubbed with a hard or coarse cloth afterwards; the wear-

ing of flannel next the skin, and of a neckcloth in winter and spring; light nourishing diet, with strict attention to the secretions and excretions; immediate recourse to medicine upon the appearance of catarrhal or croupal symptoms; and a careful avoidance of exposure to cold and moisture. When croup occurs in one child of a family residing in situations where it prevails, more will probably be attacked. In such cases, removal to a healthier air is requisite. When it is prevalent either in a simple or complicated form, and particularly when the locality also increases the risk of seizure or relapse, the occasional exhibition of small doses of calomel and James's powder, or of hydrarg. cum creta with the sub-carbonate of soda, or the having recourse to either of them every second or third night, may be tried. In this country, care should be taken not to expose children to the north-east winds of spring, particularly when they follow heavy rains, &c.

76. *B.* The Diet and Regimen, in the more acute and inflammatory forms of croup, should be strictly antiphlogistic; and all food should be withheld until the stage of exhaustion supervene, when, if light nourishment can be taken, or be desired, it should be given. In the more spasmodic or prolonged forms, light food may be taken in small quantity. The best beverage of which the patient can drink, is a very weak decoction of marsh-mallows and liquorice root, to which a little candy and sub-borate of soda are added. The *temperature* of the room should be moderately and equably warm.

77. *C.* During Convalescence, change of air, as soon as it can be safely permitted, is especially beneficial; and strict attention ought to be paid to the prophylactic means stated above (§ 75.), in order to prevent a relapse or recurrence of the malady. These precautions are required during, and for some time after, recovery from the complications and consecutive affections of croup, as well as from its simple forms. In the winter and spring months especially, the convalescent should be kept in apartments moderately and as equably warm as possible.

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CYANOSIS. See Blue Disease.

CYNANTHE MALIGNA. See Fever, Scarlet; Fauces; and Pharynx, *Inflammations of.*

CYNANCHE PAROTIDÆA. See Parotid, *Inflammation of.*

CYNANCHE PHARYNGEA. See Pharynx, *Inflammations of.*

CYNANCHE TONSILLARIS. See Tonsils, *Inflammations of.*

CYNANCHE TRACHEALIS. See Croup.

CYSTITIS. See Urinary Bladder, *Inflammations of.*

DEAFNESS. See Ear, *Diseases of*; and Hearing, *Disorders of.*

DEBILITY. — Syn. *Adynamia, Asthenia, Atonia, Debilitas*, Lat. *Die Schwüsche, Schwaschheit*, Ger. *Débilité, Asthénie*, Fr. *Debolezza*, Ital. *Vital Depression, Diminished Vital Power or Energy.*

Classif. — General Pathology; *Pathogeny.* — Special Pathology. I. Class.

1. Defin. — *That departure from the healthy condition of the frame, which consists of a diminution of its vital energies — of an enfeebling of its powers, manifested in numerous conditions and grades throughout the whole frame, or more or less remarkably in particular systems or organs.*

2. *Debility* is a state of vital manifestation intimately connected with the nature of disease; and, in whatever acceptation it has been understood, it has been admitted by every physician who has looked beyond the grosser and more palpable changes superinduced in the economy, as not only a most important pathological condition, but as often constituting what is, in the common language of medicine, disease itself. It often performs a principal part in the commencement, and towards the close, of the most severe maladies; and its modifications are amongst the most difficult in pathology to detect and to interpret aright. Several of the appellations it has received have been more or less restricted to certain of its conditions; as *adynamia*, to want of muscular or animal power; *atonia*, to deficient vital tension and tone of circulating and exhaling vessels; *asthenia*, to depressed energy of organs essentially vital, &c.: but as the distinctions between them have never been made with sufficient precision, and have seldom been preserved, and as they have all been used synonymously by the best modern writers, they will be thus received at this place.

3. It might appear interesting to ascertain the varieties and grades of debility; but this is a matter of no easy accomplishment, if not entirely beyond the reach of our powers. Debility is, besides, a relative term; and of its extent or degree of departure from that condition of vital power requisite to the perfect performance and continuance of the functions, we can form no very precise idea, even were we agreed upon the standard of power by which the comparison should be made. Of its numerous grades and manifestations, from the slightest departure from health to the utmost consistent with existence, there can be no question; and therefore they cannot be otherwise than arbitrarily appreciated. This will appear obvious to any one who will refer to the numerous varieties into which Vogel and Sauvages have divided asthenia.

4. Divisions of. — It will be preferable, therefore, to consider debility in respect merely of its principal conditions relatively to the operation of the chief causes which induce it; and, in order to elucidate its morbid relations, and its influence in producing and perpetuating further disease, to enquire into its manifestations and effects on the various general systems and organs of the body. The majority of pathological writers have found great difficulty in considering this subject, and scarcely any two have agreed as to the manner of discussing it, or as to its nature. Some have viewed it as the negative of excitation, or a minor degree of that state of excitement induced in the system by the agents surrounding and acting upon it, — by privation, or change of the factors of life (Hartmann). This opinion, which may be traced to the *Strictum* and *Laxum* of Themison; but which was first insisted on, in a manner at all accordant with the doctrine of solidism, by Brown, and variously modified and illustrated by his contemporaries and followers; led to the division of this grand pathological state into two forms, — *direct* and *indirect* debility. This division was adopted by Darwin; and Rush followed the same track, denominating the former *debility from abstraction*, the latter *debility from action.* Rasori and Tommasini hardly even modified the doctrine of Brown, when they divided it into *primary* and *secondary*; the former arising from contra-stimulating, the latter from stimulating, impressions. Broussais followed a similar arrangement; but considered that it is primary in very few instances, and only from the abstraction of stimuli. The simplicity of these divisions is their chief recommendation; but it is carried so far as to be inconsistent with the complexity of those derangements to which the human frame is subject. This feeling seems to have induced Boisseau to impute it to three sources: 1. To a complete or prolonged abstraction of the accustomed stimulus; 2. A diminution of the reciprocal stimulating influence of the organs; and 3. To the inordinate excitation of a part, rendering the others incapable of acting with energy. M. Brachet, adopting similar views to my own, but several years after mine were published, both in the *London Medical Repository* and in my Physiological Notes, refers debility either to diminution of the action of the cerebro-spinal system, enfeebling the functions over which it presides, or to depression of the functions dependent upon the influence of the organic or ganglial nerves; the weakness of the nervous system arising, as he thinks, either from deleterious states of the blood, or diminution of its quantity. Hufeland divides it into *true*, and apparent or *false*; the one from change of the nervous sensibility, the other from oppression of the vital powers. Dr. Geddings, the most recent writer on the subject, considers debility, 1st, as *direct*, when arising from the abstraction of stimuli, or the operation of contra-stimuli, or such substances as " directly enfeeble the organisation;" 2dly, as *indirect*, or that resulting from exhaustion, and " from deterioration of the nutritive molecules of the blood;" and, 3dly, as *metastatic*, or that form proceeding from inordinate irritation of one organ leaving the others in a minor state of excitation. It is impossible to examine the conditions of debility with any degree of precision abstractedly from their principal causes. I shall, therefore, with due regard to

this connection, consider, 1st, The primary or direct states of debility; 2dly, Its consecutive or secondary conditions; and, 3dly, Those forms, consisting not only of depressed, but of otherwise morbid or vitiated, vital manifestation — or complicated debility. After having discussed these topics, with reference to *general debility*, the *more special* or *partial states of debility*, and *its consequences*, will be brought into view; and the subject pursued in its relation to general and special pathology.

5. I. Conditions of Debility.—i. Primary Debility (*Direct*, Brown; *True*, Hufeland; *from Abstraction of Stimuli*, Rush and Boisseau). This state of debility is not so frequent as is commonly supposed, although by no means so rare as Broussais and his followers contend. Many of the cases commonly imputed to it strictly belong to the other conditions specified above (§ 4.). Primary debility may be, (*a*) *Original*, or congenital; and (*b*) *Acquired.* — *A.* The former of these is observed in the children of exhausted, dissipated, or aged parents, — especially the male parent, — and is familiar to every common observer. It also presents itself in the infants of those who are of a strumous diathesis, although generally in a slighter grade, and more frequently obscured by concurrent disease of particular organs. This form of debility seldom continues long without being followed by some specific malady, which it either remarkably favours, or even more directly produces, — causes, which are innocuous as respects infants of originally sound stamina variously affecting, and ultimately blighting the debilitated offspring.

6. *B. Acquired* debility presents itself to our notice in every stage of life. If it supervene in infancy and childhood, it may be, to a certain extent, perpetuated in the constitution through life. But, in whatever period it may occur, it is most frequently the consequence of the *abstraction of stimuli* necessary to the excitation and perpetuation of the vital manifestations to a requisite extent. — (*a*) The infant that is not *sufficiently*, or is injudiciously, or *unnaturally*, *nourished*, if it escape any of the maladies to which it is thereby disposed, becomes pale, languid, soft, and enfeebled, or altogether diseased: it wastes; its flesh is flabby; its growth is impeded; and it at last is the subject of anæmia, or of tubercles, or of worms, or of disease of the digestive canal, of the mesenteric and other glands, or of the joints and bones. But insufficient or inappropriate nourishment affects all periods of life in nearly a similar manner. A fish diet through life gives rise to a weaker conformation of body than food of a mixed kind. This was proved by Peron in respect of the natives of Van Diemen's Land. Similar effects follow an exclusively vegetable diet, although not to so manifest a degree. It should, however, be admitted that those who are obliged to live on one kind of food alone, are more liable to experience insufficient supplies of it. — (*b*) The abstraction of the *animal warmth* is another cause, occasioning a modified, and, as it were, an acute form of debility, followed by peculiar effects, which are fully described in the article Cold. — (*c*) The *privation of solar light* has a marked influence on the vegetable creation; plants being pale, sickly, and imperfectly developed, and their proper juices scantily and insufficiently elaborated. An analogous effect is produced by the same cause on the animal creation, and particularly on man — the body becoming pale, sickly, and etiolated; the senses remarkably acute; the general sensibility and muscular irritability much heightened; the organic actions readily influenced by the slightest external agents[*]; and the circulating fluids thin, watery, and deficient in albuminous constituents and red globules, and in quantity. Facts illustrative of this occurrence are adduced in the article on anæmia, which is thereby produced. (See Blood, *Deficiency of*, § 41.) The physical and mental debility resulting from confinement in dungeons and dark cells is to be attributed to the exclusion of light, restricted diet, want of exercise and of free air, and to moral causes combining with these in depressing the vital powers, and ultimately producing disease of a low and dangerous form. — (*d*) Intimately con-

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[*] The remarkable and authentic history of Casper Hauser, by the President Von Feuerbuch, furnishes striking illustrations of the above. The accounts which have been recently published of this person should be attentively perused by every pathologist and philosopher, as being most singular and instructive. Casper Hauser was kept, from infancy until he was eighteen years of age, in a perfectly dark cage, without leaving it; and where he neither saw a living creature, nor heard the voice of man. He was restricted from using his limbs, his voice, his hands, or senses; and his food consisted of bread and water only, which he found placed by him when wakening from sleep. When exposed in Nuremberg, in 1828, he was consequently, at eighteen years, as if just come into the world; and as incapable of walking, discerning objects, or conveying his impressions, as a newly born infant. These faculties he, however, soon acquired; and he was placed under an able instructor, who has recorded his history. Darkness had been to him twilight. The light of day at first was insupportable, inflamed his eyes, and brought on spasms. Substances, the odour of which could not be perceived by others, produced severe effects in him. The smell of a glass of wine, even at a distance, occasioned headach; of fresh meat, sickness, &c.; and of flowers, painful sensations. Passing by a churchyard with Dr. Daumer, the smell of the dead bodies, although altogether imperceptible to Dr. D., affected him so powerfully as to occasion shudderings, followed by feverish heat, terminating in a violent perspiration. He retained a great aversion, owing to their disagreeable taste and smell, to all kinds of food excepting bread and water. When the north pole of a small magnet was held towards him, he described a drawing sensation proceeding outwards from the epigastrium, and as if a current of air went from him. The south pole affected him less; and he said it blew upon him. Professors Daumer and Herrmann made several experiments of this kind, and calculated to deceive him; and, even although the magnet was held at a considerable distance from him, his feelings always told him very correctly. These experiments always occasioned perspiration, and a feeling of indisposition. He could detect metals placed under oil-cloths, paper, &c., by the sensations they occasioned. He described these sensations as a drawing, accompanied with a chill, which ascended, according to the metal, more or less up the arm; and were attended with other distinctive feelings, the veins of the hand exposed to the metal becoming visibly swollen. The variety and multitude of objects which at once came rushing upon his attention when he thus suddenly came into existence — the unaccustomed impressions of light, free air, and of sense — and his anxiety to comprehend them — were too much for his weak frame and acute senses: he became dejected and enfeebled, and his nervous system morbidly elevated. He was subject to spasms and tremors; so that a partial exclusion from external excitements became for a time requisite. After he had learned regularly to eat meat, his mental activity was diminished: his eyes lost their brilliancy and expression; the intense application and activity of his mind gave way to absence and indifference; and the quickness of apprehension became diminished. Whether this change proceeded from the change of diet, or from the painful excess of excitement which preceded it, may be questioned. My limits admit not of my adding more. The whole account is most important — the more so, as the physiological facts stated in it may be relied on.

nected with this cause and its effects, is the *privation* of *fresh air and exercise*. When muscular action cannot be performed under favourable circumstances, particularly as respects the requisite renewal of air, the circulation languishes, and suffers deterioration; the developement of the locomotive organs is either impeded or prevented, and they are no longer in a fit state for the execution of the acts of volition. By a want, also, of a requisite *renewal of air*, the stimulating constituent of it becomes diminished, and replaced by directly sedative gases, and by vapours loaded with the effluvia of the system that respires it, or of those which may respire it in the same place; the extent of the stagnation or confinement of air, and of the causes of deterioration, proportionately heightening and accelerating the depressing effects thereby produced upon the frame. — (*e*) It is extremely probable, that whatever, in its passage through the digestive canal, or circulation through the body, *abstracts oxygen from the system*, will be also, to a certain extent, a cause of debility, as supposed by HUMBOLDT. The causes of scurvy may be partly of this description; as well as those of several other diseases. — (*f*) A not uncommon cause of depressed vital power is *the young sleeping with the aged*. This fact, however explained, has been long remarked, and is well known to every unprejudiced observer. But it has been most unaccountably overlooked in medicine. I have, on several occasions, met with the counterpart of the following case: — I was, a few years since, consulted about a pale, sickly, and thin boy of about five or six years of age. He appeared to have no specific ailment; but there was a slow and remarkable decline of flesh and strength, and of the energy of all the functions — what his mother very aptly termed a gradual blight. After enquiry into the history of the case, it came out that he had been a very robust and plethoric child up to his third year, when his grandmother, a very aged person, took him to sleep with her; that he soon afterwards lost his good looks; and that he had continued to decline progressively ever since, notwithstanding medical treatment. I directed him to sleep apart from his aged parent; and prescribed gentle tonics, change of air, &c. The recovery was rapid. But it is not in children only that debility is induced by this mode of abstracting vital power. Young females married to very old men suffer in a similar manner, although seldom to so great an extent; and instances have come to my knowledge, where they have suspected the cause of their debilitated state. These facts are often well known to the aged themselves, who consider the indulgence favourable to longevity, and thereby often illustrate the selfishness which, in some persons, increases with their years. — (*g*) It is extremely possible that whatever *conducts the electricity* of the body from it, will occasion direct debility. With this view I have long been in the habit of causing females who used steel supports to their stays, to lay them altogether aside. The experiments on CASPER HAUSER confirm this supposition. — (*h*) Intimately related to the causes consisting of abstraction of requisite stimuli, and to the effects resulting therefrom, seem to be the privation of those excitants to which the frame has been long habituated; although these, as well as their effects, may be considered as falling more strictly under a different section of this subject. The privation, by whatever cause, of those states of electrical tension which exist in healthy conditions of the body, and fright, or prolonged fear, may also occasion primary debility.

7. *C.* But the vital power is enfeebled by another class of causes — by agents which seem *directly* to depress it below its healthy standard. These agents have been called *contra-stimulants* by the Italian physicians of the school of RASORI. — (*a*) Several of those, however, when employed in sufficiently small quantities, actually excite the parts to which they are applied; and it is only when they are used in large doses that an opposite effect — violent depression and even annihilation of life — is produced. A minute quantity of prussic acid, or of tobacco, excites the organic functions; a large quantity instantly destroys life: and the remark applies, to a certain extent, to nearly all the more energetic narcotics; although many of them, as well as several other agents, whilst they depress the vital manifestations generally, also excite or irritate particular organs or tissues. Tartar emetic, acetate of lead, oxalic acid, colchicum, stramonium, belladonna, &c. furnish illustrations of this fact. — (*b*) The primary effects of *terrestrial effluvia* or malaria, and of the *infectious emanations* proceeding from the diseased, as from those affected by plague, yellow fever, typhus, and pestilential cholera, are evidently most acutely debilitating, even although these causes may also, and at the same time, act by irritating certain organs or tissues. — (*c*) Various mental emotions are also very powerful depriments of vital power, such as *fear*, *anxiety*, *grief*, longings after objects of affection, *nostalgia*, &c., particularly if they be of long continuance: they retard all the organic functions, and at last wither the whole organisation. — (*d*) Whatever impedes respiration, owing to the effects of this function upon the circulation, and on the blood itself, and consecutively upon the organic and cerebro-spinal nervous systems, also depresses the vital power in a very remarkable manner. Among the causes of primary debility, Dr. GEDDINGS has included *anæmia*. There can be no doubt of the existence of debility, when the blood is deficient or impure; but, instead of being the cause, anæmia is the effect of debility.

8. ii. CONSECUTIVE OR SECONDARY DEBILITY may arise in two ways: (*a*) from increased excitation of an organ, occasioning proportionate diminution of the energy of others — Sympathetic debility, or Debility from an irregular distribution of the vital endowment; and (*b*) from the exhaustion occasioned by previous excitement. — *A. Sympathetic Debility* (*Debilitas Spuria*, HUFELAND; *Metastatic Debility*, Dr. GEDDINGS). When it is considered that the organic or ganglial nerves alone supply the blood-vessels, and the secreting organs and surfaces; that they communicate very freely with each other, and with their chief centre, the semilunar ganglion; that they are formed into numerous plexuses, rendering thereby the connection between them still more close; and that they are intimately related to the cerebro-spinal system, through the medium of communicating nerves; the mutual dependence of action between

the various organs of the body may be easily explained. If, moreover, it be granted, as I have endeavoured to prove in another work, that the most important vital phenomena, — as digestion, assimilation, circulation, secretion, animal heat, generation, &c. — in short, that life itself, with all those manifestations of it now particularised, and which have usually been called organic — result from the influence exerted by the ganglial nervous system, through the instrumentality of the vessels and structures, upon the circulating fluid they contain, and reciprocally by this fluid upon the nerves ramified in the parietes of the vessels, and upon the ganglia themselves, through which it must necessarily circulate, — the agency of this system in the production of the numerous phenomena of debility must be evident. From this view of the subject, and taking into account the various functions of dissimilar textures, and, under certain circumstances, the combined influence and reaction of the cerebro-spinal system and sensorium, the numerous relations of disordered actions, as respects the manifestations not merely of debility, but of disease generally, may be more satisfactorily traced.

9. When one organ or general system is simply excited, without being otherwise diseased, the functions of other organs, with which it is more or less intimately related by means of the ganglial nerves, undergo a relative degree of change; for as we exalt the vital manifestations in one or more parts of the series, we diminish them in equal proportion throughout the remainder. These views were first stated in the *London Medical Repository*, for May, 1822, and fully illustrated in my Physiological Notes, published in 1824; and have since been adopted by Boisseau and Geddings. A due application of them is of the utmost importance in pathology and therapeutics, as well as in ascertaining a large proportion of the forms of debility, particularly those presented to us in the course of many acute and chronic diseases: thus irritation of the mucous surface of the stomach or bowels enfeebles the rest of the frame; and inordinate excitation of any other secreting organ diminishes the nutritive and animal functions in an equal degree, and so on as respects various other viscera and structures, as more fully explained when describing the states of vital energy connected with the nature of disease. (See art. Disease.)

10. *B. The Debility of Exhaustion*, or from excitement of a part, or of the body generally (*Indirect Debility*, of Brown).—This form of debility arises from all agents, mental or physical, which excite the actions of a part, or of the system, above its normal state. Many of these causes act with great rapidity and intensity, others very slowly and insidiously; and whilst some simply change the *grade* of vital action, others seem to alter it in *kind*. Their effects vary remarkably with the susceptibility of the organ and constitution on which they act, and the frequency of their repetition; each successive application being generally less efficient than the preceding, if it be delayed until the action of the previous one has terminated. The circumstance of stimuli being productive of exhaustion, or indirect depression of vital power, to as great extent below the standard of health, as the previous excitement rises above it, as fully shown by Brown, Darwin, and Rush; and that stimuli must be repeated in larger quantity to produce the same effects, although presenting certain exceptions, are important facts as respects this pathological condition in particular, and disease in general: as long, also, as the repetition of the stimulus follows so quickly and regularly as to anticipate the appearance of the consecutive debility, the unavoidable consequences of its abstraction will not appear, at least for a very long time. But they ultimately will supervene in a most severe, and often dangerous, form, when such an event takes place; and if it does not occur soon, the prolonged excitement will ultimately terminate in organic change. Drunkards and opium-eaters often furnish proofs of the latter fact; and persons who indulge in an occasional debauch only, or who undergo great physical or mental exertions, feel the truth of the preceding positions. There is one cause, however, which requires to be particularised on account of its mode of operation and consequences: this is excessive sexual indulgence. It occasions a loss of vital power through the medium of the discharges, independently of the exhaustion consequent upon the previous nervous excitement. Its depressing effects are, moreover, experienced by all the organs, but especially in the ganglial and cerebro-spinal nervous systems; and are often followed by the most serious results in both male and female.

11. iii. Complicated Debility.—I have contended, in the article Disease, that the vital manifestations of an organ, or of the frame generally, may be modified, not only in *grade*, but also in *kind*. If this be admitted, it follows that debility, originating in either of the ways now shown, may be either *simple*, or *associated* with an otherwise morbid state of vital action. Upon a review of practical facts, we shall find that the more simple states of debility most frequently occur either primarily—especially from agents abstracting vital power—or indirectly, from causes which over-excite the nervous influence, or which abstract as well as exhaust vital power; such as the one last adduced. But the condition now under consideration is more generally the result of causes which either irritate in a slow and continued manner some particular tissue or viscus, or modify the sensibility of an organ, or change its secreting or nutritive actions, or even vitiate the condition of the circulating fluids. Whilst the preceding forms of debility are mostly met with in the commencement of diseases, or constitute the early stages of those ailments consisting almost entirely of simple asthenia, but, which are often mistaken for structural maladies, this condition is observed chiefly in the progress, or towards the close, of many acute and chronic complaints, some of which are of a specific or malignant character; and it may arise out of either of the foregoing varieties of debility, especially when much prolonged. That which becomes so remarkable in the course of typhus, or yellow fever, of plague, or of syphilis, cancer, scrofula, &c., consists not of a simple depression or exhaustion of vital power merely; for this power is also specifically modified even from the commencement of these diseases; — the sensibility and organic contractility are changed; the secretions and nutrition are interrupted, or much affected; and although the debility may be the same as to grade in several

or all of them at certain of their stages, yet is the vital endowment otherwise modified in each, and in such a manner as to present specific characters whereby they may be severally known and distinguished, without taking the grade of vital manifestations into the account. It is this form of debility which may be imputed to what has been called, in general terms, by BRERA, the evolution of matters injurious to life: and it very often arises from causes, which, by the nature of their impression upon the living frame, not merely depress, but also otherwise vitiate, the conditions of life in all the systems and organs of the body, as shown by the effects produced by the morbid effluvia of typhus, yellow fever, and other malignant diseases.

12. II. THE SPECIAL MANIFESTATIONS AND EFFECTS OF DEBILITY.—I have hitherto been considering asthenia in its *general conditions;* I have now to view it in its *specific* or *partial states.* In doing this, I shall only attempt an imperfect outline of its relations to the principal general systems and organs of the body, and endeavour to show that one or more of them may manifest this state in a greater degree than the rest, or in a modified form; and that in this manner much of the varied phenomena of disease may arise; but that neither of them can experience it to a great extent, or for a long time, without either a similar state of disease extending more generally, or some other morbid condition springing out of it,— consequences which must necessarily result from the intimate union of the different organs by the organic nervous and vascular systems, as well as from the mutual dependence of their functions, and the reciprocity of vital influence.

13. i. *Debility of the general Systems.—A.* The close connection of the *organic* or *ganglial nervous system* with the manifestations of life has been in several places insisted upon; and conformably with this opinion, and with intimate views of the origin and nature of morbid actions, debility cannot exist in a marked degree without this system being primarily affected. But of the extent of this affection we can form no estimate, excepting from the effects upon the functions of those organs which it influences. I have long considered, and on various occasions endeavoured to show, that the ganglial and the vascular systems, by their resulting and reciprocal actions, are the factors of life; and that the part which the former consequently and necessarily performs in the causation and removal of morbid phenomena is most immediate and important. If we examine closely the manner in which causes invade the frame, we shall find, a great proportion of those which produce any of the states of vital depression already noticed, make their impression in such a manner as to leave no doubt of their action being primarily exerted upon this system, thereby proving its very close connection with life. It is, however, evident that the impression made in this quarter will not remain for any time limited to it; but will extend in the first instance to those parts which are most intimately associated with it, and dependent upon it for the regular performance of their functions. This *à priori* inference is actually demonstrated by observation; for we find the circulating, the digestive, and the assimilative functions, immediately enfeebled by causes which can operate in no other way, and through no other channel than the nervous system of organic life. Such of those causes as are of an intense kind, and are most injurious to life, — which modify while they depress its manifestations, — have their impression rapidly propagated throughout this system, and to the structures and organs which it actuates; whilst those of a slighter kind, or slower operation, may exert their effects in parts of it only, or chiefly, and more or less partially in other viscera. Viewing this system, therefore, as that upon which the greater number of causes depressing the vital manifestations first exert their action, and consequently as the point whence the depressing effects proceed, I shall briefly consider these effects in each of the principal functions, organs, and structures.

14. *B. The circulating systems and fluids* are affected according to the intensity of the depressing causes relatively to the energy of the system at the time; and the ultimate results vary with the successive changes that supervene in it, and the associated nervous systems, and secreting and eliminating organs.—(*a*) In simple debility, the *heart*'s action is languid, or slow; but readily excited by stimuli. If the debility be chronic, the parietes of its cavities may ultimately become wasted or thinned; or even softened, and the cavities themselves dilated. In the advanced stages of acute or complicated debility, the heart's action is generally very quick, soft, weak, small, and unequal or irregular; and in chronic cases, its substance softened, flaccid, or even dilated.— (*b*) The *arterial* vessels lose some portion of their tone; but, excepting in as far as they convey the impulse of the heart on the blood, they are not otherwise affected until debility arrives at an advanced stage, or is acute or complicated. When this occurs, arterial action may even become very much increased, particularly as respects the frequency of the pulsation communicated by the heart's contractions, whilst the vital power of the system generally is remarkably depressed. In such cases, the pulsations are broad, open, quick, and very easily compressed; or they are small, weak, soft, and thready. Acute and complicated debility, thus presenting the apparent incongruity of great depression of vital power, with morbidly excited vascular action, is not infrequently observed in the advanced stages of those diseases in which the circulating fluid becomes contaminated by injurious matters introduced into it from without, or generated in it, in the manner explained in the article BLOOD (§ 110—144.). In these, although the general manifestations of life are enfeebled to the utmost, yet the action of the heart and arterial system is excited by the irritation produced by the contaminated blood circulating through them, and the low grade of vitality still existing is thereby soon exhausted.— (*c*) The manifestations of debility on the *blood* itself, — in occasioning *plethora* when the vital depression is so slight as not to diminish digestion and assimilation, — in favouring irregular distributions, or *determination of blood*, in its more chronic states, — in producing *anæmia*, when its grade is still lower, or when it is more prolonged, and the assimilative functions, especially affected, — and in giving rise to *contamination* of this fluid, when it impedes the secreting, eliminating, or excreting functions, — will be found discussed in that article.—(*d*) Debility seldom exists long, or in a marked form,

without the *venous* circulation becoming thereby affected. The depressing agents, indeed, which act most severely upon the frame, give rise to impeded circulation or congestions of blood through the veins as one of their more immediate effects upon the economy, as shown in the article CONGESTION OF BLOOD. — (*e*) The *lymphatic* and *absorbent vessels* even escape not the consequences of debility, particularly when it arises from original conformation, or deficient and unwholesome food. This is shown by scrofulous diseases of the glands, in the mesenteric consumption of children, and some states of dropsy. (See LYMPHATIC SYSTEM.)

15. ii. *Debility of the Functions of associated Organs.* — The functions about to be particularised are depressed by, (*a*) Causes which lower the vital actions of the foregoing systems in a general and severe manner; and (*b*) by such as operate immediately upon these organs themselves. The former, being more general, and more intense in their operation, are immediately followed by arrest, or remarkable disturbance, of the functions in question; whilst the latter causes usually, but not always, over-excite and thereby exhaust these functions, and, by the frequency of their repetition rather than by their intensity, produce their effects more slowly and partially. *A. The digestive and secreting organs* are amongst the first to experience debility, however induced. This may arise from the evident dependence of their functions upon the ganglial system of nerves. But they may be especially affected, and may continue so for some time, without other parts of the frame evincing much disorder, particularly when the debility has been slowly and indirectly produced. The more special manifestations of debility in the *stomach*, the *liver*, the *duodenum*, and *bowels*, usually begin in this way; and they have severally obtained, according to the forms they assume, the names of indigestion, torpor of the liver, flatulence, constipation, colic, &c. — these being the more common effects, although several others may be adduced. When debility, either of an acute or chronic form, affects chiefly the digestive organs, the abdominal *secretions and excretions* are more or less disordered — are usually in smaller quantity and vitiated quality. But this is not the only result; they are generally retained on the surfaces and situations where they are secreted, until they undergo various changes, and acquire irritating properties. This is well illustrated by many of the functional diseases of the *liver*, and bowels. (See CÆCUM, COLON, CONCRETIONS, CONSTIPATION, LIVER, WORMS, &c.)

16. *B.* The *respiratory and assimilating functions* manifest debility in various ways; the respiratory by frequency, shortness and quickness of action, and diminution of the changes usually produced upon the blood and air respired; the assimilating function by the thin and watery state of the blood, by the deficiency of its quantity, or of its red particles, as in *anæmia*, and, in slighter cases, by the milky or oleaginous condition of the serum. When debility is slight or recent, or when it has been gradually induced by stimulating agents, *nutrition* is not very materially affected; it may even be partially increased, owing to impeded or imperfect secretion and assimilation, the consequent abundance of fatty matter in the circulation, and its deposition in the adipose structure, thereby increasing the bulk of the body. But when the vital energies are more remarkably depressed, either in acute, chronic, or complicated cases, the nutrition of all the structures and organs, particularly of adipose, cellular, and muscular parts, is more or less arrested.

17. *C. The vital manifestations of the cerebro-spinal nervous system, and organs of sense*, may be remarkably enfeebled, without the rest of the frame being materially affected: but they may also be uncommonly active, although all the other functions of the body are debilitated. *Idiotcy* and certain states of *insanity* are often met with unconnected with any marked depression of the physical powers; and, on the other hand, particularly in chronic debility attended by emaciation and quickened circulation, the powers of mind are frequently very acute. The slightest change in the freedom, activity, or quickness of the circulation in the brain and spinal chord, and in the purity of the blood, will materially affect the character of the phenomena associated with debility of these organs, or of the body generally. As long as the circulation is unimpeded, and the blood sufficiently purified by the emunctories, debility will be attended by great activity of all the senses, and increased irritability of all the muscles. Hence arise various of its forms, familiar to every observer of disease, — that *with increased sensibility* (the *Debilitas ad Sensum* of some writers), and that *with augmented irritability* (the *Irritable Debility* of HUFELAND and other German authors, — the "*Mobility*" of Dr. CULLEN); both which forms constitute increased susceptibility, or excitability, of the cerebro-spinal system, and of the organs they influence. When, however, retarded circulation occurs in this system, or if the blood itself be rendered inappropriate to its state and functions, by the superabundance of unassimilated materials, or if it be insufficiently purified by the emunctories, debility, whether thus limited or universal, will be attended by a proportionate degree of *torpor* (the *Torpid Debility* of HUFELAND), as well as by adynamia of all the organs dependent upon this system; instances of which are sufficiently common in many acute diseases. In this way the various manifestations of debility in the mental faculties, the general sensibility, and the mobility of the frame, in different cases and complications of disease, may be explained, — particularly if the various organic changes which so often supervene or become associated with this state of vital power, and with either of the conditions of the cerebral and general circulation now alluded to, be called into aid. The *causes* also, the nature of their impression, and their mode of operation, will remarkably modify the state and duration of cerebral asthenia. These are chiefly, (*a*) Such as act immediately on this system, — as inordinate mental exertions, the depressing passions and emotions, excessive fatigue, and narcotic poisons. (*b*) Those which act indirectly or mediately, — as the intense or prolonged impression of cold on the surfaces, terrestrial and infectious miasms, the actions of various sedative or contra-stimulant agents, and the abuse of the sexual organs; all which occasion modified or even different effects. The *organs of sense*, as

well as other parts immediately controlled by the cerebro-spinal system, have their functions enfeebled and impaired in proportion to the debility it experiences. But they may also be individually affected, and in various degrees, without this system being materially disordered. Such occurrences generally arise from the operation of local causes, — as over-excitement of the organ, and exhaustion of its sensibility by its peculiar stimuli; as weakness or loss of sight from over-exertion, or the intense or prolonged action of light; and loss of hearing from great noises, &c.

18. *D. The muscular structures*, from their connection with the ganglial and cerebro-spinal systems, necessarily experience the effects of depression of the energies of these systems, varying, according to its acute and chronic form, its degree, its simple or complicated state, and the progress it has made. But debility seldom originates in, or is limited to, these structures. Its earliest and simplest manifestations in them are diminished tone, flaccidity, wasting, particularly of voluntary muscles; lowered, or, in some cases, morbidly increased irritability, according as the nervous systems experience a diminution or increase of their susceptibility (§ 17.); occasioning, in some cases, irregular and tremulous motions, and a disposition to spasmodic or convulsive action, but more frequently defective energy of contraction, or power of continuing and repeating it, in both the involuntary and voluntary classes of muscles. In the more acute, or the more advanced and complicated states of adynamia, the insensible tonic contractility of muscular fibres are in a great measure lost; their vital cohesion is also so much diminished as to admit of their being more easily torn; they are incapable of performing even a portion of their functions; and their contractions are feeble, vibratory, or oscillating, productive of the utmost fatigue, sometimes of death; and the least exertion, even that requisite to preserve the body recumbent upon one side, cannot be sustained for a few minutes. These extreme states of debility occur in the most dangerous and severe cases of disease, as in adynamic fevers, scurvy, &c., and when the circulating and secreted fluids have become sensibly changed from their healthy condition.

19. *E.* The *sexual organs*, whilst they participate in the vital depression of the general systems, are often themselves chiefly affected. It is by no means uncommon to meet with instances, particularly in the male sex, of the most complete debility of these organs, amounting sometimes to entire loss of function, from precocious and inordinate excitement and indulgence; there being little or no other disorder, excepting enfeebled mental manifestation, in some cases. In others, however, all the organic and cerebro-spinal functions have become remarkably weakened, although not to the extent experienced by the organs in question. (See Impotency.)

20. iii. *The Manifestations of Debility in particular Tissues* are less evident than in the general systems and associated organs; and they are later in becoming evident. It is usually not until they are extreme, long-continued, or complicated, that they are remarkable. — (*a*) The *cellular tissue* at first evinces deficient firmness and elasticity, with softness, and, as debility increases, loss of its vital cohesion: it at last presents a tendency to œdematous or serous infiltration, and even to hæmorrhage, owing to weakness of the extreme vessels terminating and originating in it, and the insufficient support it yields them. When it is thus changed, the spread of other diseases through it is thereby remarkably promoted, and an unfavourable termination hastened, — as in cases of diffusive inflammation, erysipelas, punctured or poisoned wounds, &c.; its vessels having lost their power to limit the extension of inflammation by forming coagulable lymph. — (*b*) *Mucous membranes* are amongst the earliest of the particular tissues to experience the effects of debility, thereby increasing and perpetuating many of its phenomena. At first their functions merely are impeded; their secretions either diminished, or imperfectly excreted, or increased from relaxation of their vessels, or in other respects vitiated. As debility, whether of them especially, or of the frame in general, advances, vital cohesion becomes impaired, and they yield not the requisite support to their vessels; whence result softening, hæmorrhage from their surface, ecchymosis, asthenic ulceration, atrophy, &c. — (*c*) The *serous tissues* undergo a partial diminution of their cohesion, and permit an aqueous or serous fluid, in some extreme cases tinged with blood, to escape through their exhaling pores. — (*d*) The *erectile textures* at first evince greater susceptibility, particularly when debility has been induced by inordinate excitement of the sexual organs; but as it increases, they lose their peculiar functions. — (*e*) The *fibrous tissue* also experiences relaxation, becomes less elastic, and more readily yields than in health, giving rise to almost spontaneous dislocations, — results which have occurred in the chronic debility caused by masturbation, as remarked by Sir Astley Cooper and Mr. Copland Hutchison, and by myself in one case. — (*f*) The *osseous texture* occasionally experiences, in children, an imperfect deposition of ossific matter, or even absorption of a great part of that already secreted; and, in aged persons, the removal of the animal matter which gives due cohesion to this structure: and, (*g*) The *corneous tissues* are often variously changed; the hair either falling out, or becoming thin, weak, or grey; the epidermis inclined to exfoliate, and rough or scaly; and the nails thin, long, crooked, or irregular.

21. III. Debility of the whole Frame. — Debility seems, as already stated, most frequently to originate in the ganglial and vascular systems, which I have viewed as the chief factors of life; the digestive, assimilative, excretory, and cerebro-spinal organs being subsequently affected. But it may also commence in, and continue for a considerable time limited to, either of these, or even, although rarely, to one or more of the individual tissues. When existing thus locally, it usually springs from local and indirect causes, and is at first of a slight grade, the functions of the part merely being impeded; but, as it continues, the rest of the economy becomes implicated in various degrees, owing to the reciprocity of vital action and function existing throughout the frame. With this universal diffusion of asthenia, the part primarily disordered may still continue affected in a greater degree, exhibiting the changes of func-

tion, and even of structure, now briefly sketched in respect of the principal systems, organs, and tissues, according as they may be implicated; but, in many instances, the debility becomes co-ordinate throughout; and in rare cases, the part originally affected even partially recovers its powers upon some other organ having its vital energies more remarkably depressed.

22. IV. CHARACTERISTIC SIGNS, &c.—When asthenia is thus general and fully developed, the external aspect of the body, and all the vital functions, are affected; the extent and specific characters of ailment furnishing important pathological as well as therapeutical indications to the practitioner:—The countenance is pale, thin, or collapsed, sometimes bloated and discoloured: the eyes lose their animation, and sink in the sockets, and they are surrounded either by a dark or bluish, or by a tumid and œdematous, circle; the expression of the features is languid and depressed; the lips are pale; the tongue watery, moist, soft, broad, and sometimes tremulous, and the papillæ depressed and wasted; the voice and speech are weak, or nearly lost; the voluntary muscles lose their powers, and hence, in extreme cases, the continued supine posture, the inability to retain a position on either side, the sinking down in bed, and the falling of the head on the breast or on either shoulder. The surface of the body has its temperature diminished, is sometimes partially covered with a cold or clammy perspiration, becomes soft and flabby, occasionally of a more lurid or dirty hue, or pale and waxy, particularly in complicated debility; the firmness and elasticity of the soft solids are lost, and they either present a leucophlegmatic appearance, or they are remarkably emaciated,—the latter being particularly the case when the circulation is accelerated. The functions of the stomach and bowels are impaired, or altogether suppressed; and hence the want of appetite, the constipation, and emaciation,—which last affects first the adipose tissue, and next the cellular and least vitalised structures. When the depression is very great, the vital attraction requisite to the nutrition and healthy cohesion, especially of the more remote and superficial parts, being necessarily diminished, the function of absorption gains the ascendancy; and the less perfectly animalised constituents, particularly the adipose substance and the effete elements, are carried back into the circulation; and thus, in some states of disease, the body continues to live upon itself, until the functions are restored, or life extinguished; the external soft solids, attached to, or covering, the bones, meanwhile becoming remarkably extenuated. In general, the pulse is frequent, soft, small, and easily compressed; the action of the heart is weak, and leipothymia or syncope occur upon exertion, or on quickly assuming the erect posture. Respiration is frequent, imperfect, or anxious or difficult, and the motions of the thorax are slight and confined. The functions of the cerebro-spinal system are more or less enfeebled; and, with the changes described above (§ 17.) present the following phenomena:—Loss of memory; inability to prosecute a lengthened chain of discussion, or to fix the attention long on one subject; sometimes weakness, with hebetude of all the faculties; an unpleasant feeling of languor, and exhaustion, with a sense of anxiety referrible to the præcordia and pit of the stomach; vertigo or headach; noises in the ears, either with or without impaired hearing; weakness of the limbs, and relaxation of the ligaments of the joints, with tremors, occasionally convulsive movements, or local paralysis; and ultimately low or quiet delirium.

23. V. DIAGNOSIS.—A distinction has usually been made between *real* and *spurious debility*. The latter term, however, implies a contradiction. But as it is the morbid condition, and not the name imposed upon it, that requires notice, I may briefly allude to it. The state of system, to which this name has been applied, would be better expressed by denominating it *oppression of vital power;* this, or nearly similar appellations (*"oppressio virium," "debilitas ab oppressione"*), having been employed by several modern pathologists. The vital manifestations may be generally or partially *oppressed* by whatever impedes their free reaction in removing the impression produced by injurious agents, or by whatever arrests the function of an important secreting organ or vital emunctory, whereby the vascular system becomes overloaded, and consequently oppressed throughout, as well as in the organ whose functions have been interrupted. The distinction will be more easily understood by a reference to facts.—During pneumonia, the lungs perform their functions in respect of the blood imperfectly, and the various secretions and excretions are diminished. Hence the quantity of the circulating fluid is increased; the circulation through the inflamed lung rendered difficult; the functions of this organ impeded, and the vessels generally distended beyond their power of reaction upon their contents, so as to restore the suspended functions. In such cases, the pulse is suppressed, and not much accelerated; but it conveys the sensation of a confined limit of pulsation, thereby suggesting the idea of a sustained state either of tonicity which the systole of the ventricle cannot much affect, or of distension upon which the elasticity of the vessel reacts imperfectly in the intermissions between the systoles. That this state actually obtains, is shown by the effects of blood-letting in changing the character of the pulse, in removing the feeling of oppression, and in partly restoring the strength. Inflammations of other organs—as the liver, brain, &c.—also furnish instances of oppression of vital power. In all these, however, the state of the surface of the body, and other symptoms above noticed as characterising true debility (§ 22.), do not exist. In fevers, also, the reaction following the impression of the exciting causes is very generally attended by oppression of the powers of life, owing, in some cases, to an overloaded state of the circulation from interrupted secretion, &c.; and, in other cases, partly to this circumstance, and partly to the depressing influence produced by these causes still continuing, and, jointly with the increase in the quantity of the circulating fluid, favouring congestion of internal secreting and vital organs. Hence, in several forms of these diseases, a complicated pathological state is the result; viz. *depressed*, followed by *oppressed*, vital power, as soon as attempts at reaction begin to be made, in order to overcome the injurious impressions and changes occasioned by the exciting causes. This suppression of power may arise out of true

debility, may be associated with it, and terminate in it, in its worst and complicated states.

24. The DURATION of debility is extremely various. It may, particularly when acquired and slight, be remarkably long, or continue through life, which it may not even abridge. When rapidly and *primarily* produced, or general and intense, or complicated, it is usually *acute* as respects its continuance; but when *consecutive*, or partial, or the result of irritation of particular textures, it is prolonged into the *chronic* state; its duration depending greatly upon its degree, and both being extremely various.

25. VI. PATHOLOGICAL RELATIONS. — i. The CONSEQUENCES AND TERMINATIONS of debility are, (*a*) Impeded or interrupted secretion; (*b*) Changes of the circulating fluids; (*c*) Various states of irritation, or inflammatory action, in particular organs or tissues; (*d*) General reaction of the vascular system, associated with various grades of vital power, from the lowest, or most asthenic, to its highest, or most sthenic form, with their modifications; (*e*) Changes in the firmness, elasticity, nutrition, colour, form, and vital cohesion of the soft solids, and, in some instances, ultimately in the hard solids also; (*f*) Effusions of fluids (aqueous, serous, sanguineous, &c.) from mucous or serous surfaces, or in cellular or parenchymatous structures; (*g*) The production of numerous forms of organic change; (*h*) The formation of new or adventitious tissues or productions, as tubercles, tumours, melanosis, cancer, hydatids, worms, gangrene, &c.; and, (*i*) lastly, Death, which may occur directly from the intense action of the depressing cause, but more commonly through the medium of one or more of the changes now enumerated, the first and greater part of which often taking place consecutively.

26. ii. ASSOCIATIONS OF DEBILITY. — Asthenia is very frequently connected with some other morbid condition, implicating either particular parts, or the system generally. Amongst these are the *consequences* now enumerated (§ 25.); but the most important are, (*a*) The association of depressed with otherwise modified or morbid states of the vitality of the system; (*b*) with a vitiated condition of the blood and secreted fluids, either or both of which constitute the complicated debility already mentioned (§ 11.); (*c*) with a disposition to solution of the textures generally, or of a part merely, as in malignant fevers; (*d*) with congestions, and chronic or acute inflammations of particular organs or structures, as in complicated forms of fever, erysipelas, diffusive inflammations, dysentery, &c.; (*e*) with intestinal worms, hydatids, and various malignant and adventitious formations.

27. A knowledge of the pathological relations of this most important and singularly overlooked condition of vital power is necessary to the practitioner, inasmuch as it enables him to entertain enlarged and connected views of disease, by the aid of which he may the better comprehend such states of disordered action as cannot be readily assigned to any particular type or specific form, owing to their imperfectly marked characters, the associated disturbance of different organs and structures, and the want of prominent symptoms whereby they may be ascertained. Debility not only constitutes, in its more intense forms, disease itself, and a most serious part of many of the most dangerous maladies, but it also *predisposes* the body to be affected by the numerous injurious agents to which it is constantly exposed.

28. iii. The PREDISPOSITION to be affected by the exciting causes of disease, arising out of debility, will necessarily vary with the form and grade it assumes, and the circumstances in which it has originated. This proposition is too evident to require illustration. But when the debility proceeds from irritation of one or more structures abstracting vital power from the rest (§ 9.), it may not increase, but may in some cases diminish, predisposition, particularly when it is attended by exalted sensibility and accelerated circulation. Thus the debility attending irritation in any part of the respiratory organs even diminishes the disposition to be affected by malaria, and infectious or epidemic agents. So much, however, of what constitutes liability to diseases is owing to the temperament, diathesis, the modes of life, and habit of body, as well as to general or local debility, that the exact share of each can rarely be ascertained. General debility either in its direct or primary form, or as consecutive of over-excitement, disposes the system to be affected by terrestrial emanations, vicissitudes of season and weather, and infectious effluvia. The more local or partial states of debility, particularly when existing in secreting organs and the associated structures, render them liable to congestions, inflammatory irritation, to disordered secretion and excretion, to spasmodic or convulsive movements, to effusions, to various states of inflammation, and organic change, with the other *consequences* and *associations* of debility above enumerated (§ 25, 26.), upon exposure to causes which disturb the *balance* of vital manifestation throughout the frame in a sudden or violent manner, or which impede the assimilating and depuratory functions, and thereby disorder the vascular actions and the circulating fluid. (See DISEASE — *Causes of*.)

29. VII. TREATMENT. — In attempting to remove debility, our means should be directed with a strict reference to its form, grade, and complication. These, however, are so numerous, that precise rules of treatment cannot be laid down; the only attempts of this kind that can be made, falling more appropriately under those diseases of which depressed vital power forms an essential part. (See especially the FIRST CLASS of the author's classification.) In the treatment of debility, in either its simple or associated states, there is a particular class of remedies, viz. *tonics*, which are more beneficial than any other; although many articles belonging to other classes, as diffusive stimulants and antispasmodics, may often be prescribed, and with great advantage. Tonics, which have derived their name from their influence in augmenting the tone of contractile parts, owe the principal part of their good effects to their elevating, in a gradual manner, depressed vital power, hardly up to, and seldom or never above, the healthy standard; and to the permanency of their action. By their repetition before the effects of the previous dose have subsided, the beneficial influence ultimately is propagated throughout; and as soon as one or more important functions are restored, the rest participate in the change, and the whole assume

a regular discharge of their offices, owing to the reciprocity of vital influence and function existing throughout the economy. Much, indeed, if not more, is also due to the partial absorption into the circulation of their active constituents; and to their direct action on the vessels, the different tissues, and on the blood itself. Although various diffusive stimulants and antispasmodics produce beneficial effects in several states of debility, yet they are generally much less serviceable than tonics, and in many instances are even injurious, chiefly from the quickness and little permanency of their action, from their proneness to over-excite and over-heat the system, and consequently to indirectly depress its energies. Hence, in order to perpetuate their restorative effects, it becomes requisite to repeat them more frequently; and thus a habit and desire of excitation is generated, which, if not gratified, is followed by insupportable exhaustion. However, in many states of disease, they are beneficial from the rapidity of their action, and are useful adjuncts to more appropriate means. As all the agents which restore the vital energies vary not only in the grade, the rapidity, and the permanency of their action, but also in respect of the organ, or the system, or tissue, on which their influence is chiefly exerted, it becomes a most important object in practice to ascertain the part primarily and chiefly affected, and to prescribe them according to our knowledge of their mode of operation.

30. Before adopting measures to remove debility, we should ascertain, 1st, The *causes* in which it has originated; 2dly, Whether or no it may not be apparent merely, — the consequence of *oppressed*, and not of *depressed*, vital power; 3dly, If it proceed or not from *irritation*of a particular part, abstracting the due energy from others; 3dly, Whether it be *simple* or *complicated;* and, 4thly, If it be *associated* with any local mischief or *change of structure*. Having ascertained these important points, the next object is the choice of agents, and appropriation of them to the states of debility presumed to exist. It is chiefly to the neglect of a pathological analysis similar to the above, of the cases which occur in practice, that the abuse of tonics in diseases of debility is chiefly to be attributed.

31. i. *Primary Debility* should be treated, conformably with the injunction now given, with strict reference to its cause, to the particular form it has assumed, and the organs or parts chiefly affected. If it have arisen from abstraction of the stimuli necessary to health, these should be restored; if from depressing agents, whether physical or moral, these should be counteracted as far as may be. — (*a*) When debility is manifested more especially in the viscera immediately influenced by the *ganglial* and *vascular systems*, it very generally proceeds from one or other of these classes of causes; and, besides their removal or counteraction, requires, according to the rapidity and the intensity of their operation, the most carefully selected remedies. If the vital depression be rapidly progressive or very great, diffusive stimuli, as camphor, ammonia, the æthers, serpentaria, arnica, &c., will be requisite in the first instance, until it is arrested, when tonics will be more serviceable; but, with the first indication of reaction, stimuli of every kind should be laid aside, lest the consequent excitement should be carried to an inordinate height by their means. The propriety of prescribing tonics appropriately to the states and grades of debility, as insisted on by Hoffmann and Thomann, cannot be doubted; but opinions will differ widely as to those which are more suitable to certain conditions. When the vital depression affects the action of the heart more particularly, after momentarily exciting the olfactory and respiratory nerves, as well as those of the stomach, by means of the volatile and diffusive stimulants, as the æthers, ammonia, and aromatic spirits, &c., the more permanent tonics should be employed. If there appear to be a deficiency of blood in cases of this description, the preparations of iron will be most serviceable, and will be advantageously combined with myrrh, cinchona, gentian, willow-bark, cascarilla, and the sub-carbonate of potassa. If the organic nervous influence be depressed, without any manifest deficiency of blood, either of these vegetable tonics may be taken, with the fixed alkalies or their sub-carbonates, or with the mineral acids, according as it may be desirable to promote the secretions, or to impart tone to the extreme vessels. When we wish to excite the functions of the viscera generally, and particularly when the blood does not undergo the requisite changes as it circulates through the different assimilating and depuratory organs, the chlorates of potass and soda (the oxymuriates) will be found of much use. I have employed them for several years with much benefit, at the Infirmary for Children, in diseases of debility affecting chiefly these organs, as well as the preparations of iodine, especially the hydriodate of potass. The bitter tonics, combined with aperients, will also prove of great service in similar cases. The marked advantages of associating individual medicines from each of these two classes, — first made known to me by the writings of Hoffmann, and confirmed by repeated observation, — are brought about both by their increasing the action of the secreting and excreting viscera when thus conjoined, and by their improving thereby the condition of the circulating fluids, as well as permanently exciting the vital influence. In some cases, the combination of small doses of the extract of nux vomica, or of strychnine, with aloes and myrrh, has proved equally beneficial. It was in pathological states similar to those now under consideration, that phosphorus was prescribed by Conradi and others, that the inhalation of oxygen gas was strenuously advised by Beddoes, and that electricity and galvanism were generally recommended by Continental writers. But I perfectly agree with Grapengeisser, in viewing these as calculated to be injurious where there exists any increase of irritability, either locally or generally, or where any vital organ is congested.

32. When debility is the consequence of the injurious impression of some powerful agent, as terrestrial or infectious effluvia, it will often be most advantageous to interrupt the succession of morbid phenomena by the exhibition of the most active tonics in large doses, and in conjunction with warm cordials. All the more intense states of primary debility proceed from impressions

made by sedative causes upon the ganglial system, and may be removed by counter-agents directed to the same system, before consecutive changes have advanced far, or the functions of the emunctories and the state of the circulating fluid have been disordered to the extent of giving rise to the early phenomena of febrile reaction. Thus, the more stimulating emetics, immediately followed by powerful tonics, or cathartics preceded by or combined with warm tonics, will often prevent the accession of fevers, when exhibited before the cold stage, or rigor, has commenced; and, in some cases, although it have commenced, if it have not terminated in excitement. But, in these cases, the tonics and other excitants prescribed should be of such kind, and in such quantity, as will make a powerful impression on the nervous system of organic life, and as are calculated to restore the suspended secretions. The preparations of cinchona, or the sulphate of quinine, combined with the hot spices, as capsicum, or with camphor, or with ammonia, and prescribed in large doses after an emetic, and followed by a purgative conjoined with the same stimulants, are the most eligible in such cases. The preparations of arsenic, the sulphates of zinc and iron, piperine, the muriate of ammonia, the chlorates, and various other tonics, are also appropriate in cases of primary debility, especially when assisted by the cardiacs now mentioned; but they are less efficient than the foregoing in removing the vital depression primarily induced by the exciting causes of fevers.

33. When asthenia affects especially the capillary vessels, and the crasis of the blood is deficient, or when hæmorrhages take place unattended by vascular excitement, the more astringent tonics should be given with sulphuric acid; and if the loss of tone be excessive, these should be associated with cardiacs and aromatics, and alternated with moderate or full doses of the more energetic terebinthinates, and balsams; morbid secretions being duly evacuated by the preparations of rhubarb.

34. (*b*) Debility manifested chiefly in the *associated organs of digestion*, can never be permanently removed, unless the secretions and excretions be duly promoted; and, for this purpose, the combination of tonics and aperients alluded to above is the most efficacious. But this practice should not be resorted to whilst irritation, or active congestion of, or determination of blood to, any of these viscera exists, lest we thereby convert such disorder into inflammatory action. In such circumstances, the more heating tonics, or those which contain most of resinous or oleaginous constituents, are the least appropriate. Where irritation of the digestive mucous surface is complicated with debility of these organs, mild tonic infusions may, notwithstanding, be exhibited with benefit, especially those of calumba, gentian, cinchona, quassia, &c.; and may be combined with acids, or with small or moderate doses of the nitrate of potass, or the sub-carbonates of potass or of soda, or with both the nitrate and sub-carbonate. It is chiefly in cases of this description that diffusive stimuli and heating tonics, so much and justly inveighed against by Broussais, Otto, and Philips, are injurious. When asthenia is associated with a somewhat lax state of the bowels, not proceeding from inflammatory irritation of their mucous surface, muriate of lime, or cusparia, calumba, quassia, or cascarilla, with the alkaline sub-carbonates, &c., are generally of service. When the debility of these organs is attended by torpor of the liver, or accumulations of bile in the gall-bladder and hepatic ducts deobstruent purgatives should precede the exhibition of tonics and stomachics. If it be associated with *worms*, purgatives, and afterwards chalybeate tonics, are required.

35. ii. *Treatment of Consecutive or Secondary Debility.—A.* It will generally be found, when the debility arises *from irritation of some organ or secreting surface*, that tonics or stimulants, unless such as are mild, and contain but little of an essential oil or other heating constituents, combined with deobstruents and anodynes, will prove either of no service, or injurious, from favouring the supervention of inflammatory action and organic change. Similar effects are also apt to follow the exhibition of tonics, when debility is attended with congestion of some internal viscus, or obstruction of secreting organs: and they will seldom be of any benefit until these affections are in some measure removed; unless the powers of life are incapable of themselves of restoring the tone of the circulation and the suspended secretions, by developing a healthy reaction. In such cases, local depletions, and remedies calculated to excite secretion and excretion, should precede, or even in some instances accompany, the exhibition of gentle tonics, which ought to be prescribed in conjunction with deobstruents, assisted by change of air and a light nutritious and farinaceous diet.

36. *B.* The debility which follows over-excitement, or *which consists of exhaustion of power*, requires means proportionate to its degree and form. The most intense grade of exhaustion occurs in the last stages of adynamic or malignant fevers, and of some other acute diseases; and often demands not merely permanent excitants, but the more active stimuli, as camphor, ammonia, serpentaria, arnica, wine, spirits, æthers, &c., to prevent the rapid extinction of life: whilst other states of exhaustion, especially such as are slower in their accession, or follow local inflammations, spasmodic or hæmorrhagic diseases, and the less severe forms of fever, admit only of the more gentle tonics; and even these, particularly if they be not cautiously prescribed, may reproduce the disease which occasioned the debility, especially if it was inflammatory or hæmorrhagic. It is not uncommon to find acute inflammations rekindled, or chronic inflammations follow the acute; and relapses of fevers, or visceral engorgements, or obstructions, supervene, when the exhaustion has been treated by heating tonics or stimulants, or by a premature use of a too full or stimulating diet. On the other hand, too strict exemption from all restorative means has been not infrequently followed by permanent general or local debility, or by very slow recovery; and it has often favoured the accession of other acute or chronic diseases; exhaustion predisposing the system to be impressed by their exciting causes. In the more difficult and doubtful circumstances of this form of debility, it will be, upon the whole, judicious to trust chiefly to wholesome air and suitable diet; and, if tonics or stimulants are

necessary, to select those which are the least heating, and to exhibit them along, or alternately, with such medicines as will promote the secretions and excretions most requiring aid, and with internal and external derivatives from the principal seat of disease. In cases of this description, particularly in the young, and in those who previously enjoyed a sound constitution, the returning energies of life generally stand but little in need of a spur; they require rather a judicious guidance, especially in respect of the digestive, the secreting, and excreting functions.

37. iii. *Complicated Debility*, or that condition of the frame which consists not merely of a depressed, but of an otherwise morbid state of vital power, has been ascribed above — 1st, to unwholesome food, and to imperfect assimilation; 2dly, to an impure or altered state of the circulating fluid, occasioned by impeded or disordered secretion and excretion; and, 3dly, to the absorption of morbid matters into the blood, either from some one of the mucous surfaces, or from parts of the body in which they have been generated. The operation and effects of these sources of contamination have been fully insisted on in the articles Absorption, and Blood (§ 110—151.). The indications of removing them may be resolved into the following: — 1st, To cut off the supply from the sources of contamination; 2d, To raise the powers of life, as expressed chiefly in the *ganglial* and *circulating systems*, by the means pointed out under that head (§ 31.); 3d, To promote the depuratory actions of the emunctories.

38. *A*. The propriety of endeavouring to accomplish the *first* of these intentions cannot be questioned; but, when the contaminating matters are formed in some part of the system, as in various malignant diseases, apparently local at their commencement, it frequently cannot be put in practice, or the period at which it might have been attempted with any prospect of success may have passed, and the other intentions are our only resort. — *B*. The *second* indication is to be fulfilled by the remedies already noticed (§ 31.), and the treatment recommended in the article Blood (§ 157.); particularly by the alkaline chlorates; the preparations of bark, of iodine, of iron, of arsenic, or of zinc; by astringents and antiseptics, as the acetic and citric acids, &c.; by the preparations of the bitter roots and woods, or of the aromatic and tonic barks, with liquor potassa, or the alkaline sub-carbonates, in the more chronic diseases, and with the sulphuric, the muriatic, or nitric acids, in the more acute maladies, and with warm spices, &c.; and by the gum-resins, the balsams, the terebinthinates and camphor, prescribed according to the circumstances of the case. — *C*. But whilst we are endeavouring to elevate vital energy by those and other means, we should also fulfil the *third* intention, by associating, or alternating, them with the more tonic and stomachic purgatives, or with warm and stimulating diaphoretics, as the abdominal or the cutaneous secretions may require to be promoted.

39. iv. *Debility affecting chiefly associated organs, or particular textures*, requires nearly similar means to those already advised, according to the grade and form it may assume. The treatment of its manifestations in the *ganglial* and *vascular systems*, and in the *digestive viscera*, has been already noticed; and is still more particularly discussed in the articles Blood, Colon, Indigestion, &c. — *A*. Debility of the *cerebro-spinal organs* must be treated according to the causes that have occasioned it, and the characters it presents. The causes, whether moral or physical, should be removed or counteracted as far as possible; and if it have arisen from mental excitement, repose and agreeable amusement should be inculcated. (*a*) When it is characterised by increased *sensibility*, the bitter infusions with liquor potassæ or the sub-carbonates of soda or potash, with conium or hyoscyamus; the preparations of iron; chalybeates; vegetable tonics and aromatics, with small doses of opium or the preparations of morphine; cold or shower baths; sea-bathing, change of air, &c., mental tranquillity, and agreeable employment; are amongst the most efficacious means. (*b*) If it be attended by increased *irritability* or *mobility*, the mineral acids, alone or with bitter infusions; the preparations of cinchona; the acetic acid; Hoffmann's anodyne, valerian, assafœtida, musk, or vegetable tonics, with opiates or anodynes, the prussic acid, the Iceland moss, ass-milk, alkaline or tepid baths, &c., are suitable remedies. (*c*) If the debility be great, and particularly if it be attended by *torpor* or depression of the sensibility depending neither upon cerebral congestion, nor upon a plethoric state of the vascular system, the warm or diffusible stimulants, combined with permanent tonics; aromatics and cardiacs; iodine, strychnine, or the extract of nux vomica in small doses; coffee; camphor or phosphorus in minute quantities; warm salt water bathing; the shower bath; chlorine fumigating baths; the use of astringent and camphorated washes to the head and surface of the body; the nitro-muriatic acid bath, or sponging the surface of the trunk, or even the head itself, with a tepid wash containing these acids, may be tried and associated with the foregoing, or other internal remedies, according to the peculiarities of the case.

40. *B*. The *sexual organs* are debilitated — (*a*) from imperfect developement, depending upon their interrupted evolution, or upon general asthenia; and (*b*) from over-excitement. The *first* of these causes seldom occurs in the male, but not infrequently in the female (see Chlorosis, and Menstruation), and in such cases requires the constitutional treatment there described. The *second* cause is common to both sexes, although perhaps more so in the male than female. When it has thus originated, and exists merely in a slight degree, without amounting to impotency, the organs will recover their energies soon after marriage, if regular and abstemious habits be adopted. In other circumstances, and in severer cases, attention should be paid to the general health: the mind ought to be occupied by interesting pursuits; the patient should rise early in the morning, and use the shower bath, or local aspersion or affusion, and live regularly. If the causes in which it originated be relinquished, the sexual function will soon be restored. The tonics which are the most efficacious in cases of this description are, the muriated tincture of iron, taken in the infusion of quassia, or of chamomile flowers; the tincture of iodine; coffee; and the extract of conium,

with the preparations of cinchona, cascarilla, or iron, &c. (See IMPOTENCY and STERILITY.)

41. *C.* The manifestations of debility in the *cellular*, the *mucous*, and other tissues, must be treated according to the principles already stated. When asthenia in any of its various forms affects the digestive *mucous surface*, the treatment already noticed (§ 34.) is applicable. If it be attended by hæmatemesis, malæna, or intestinal hæmorrhage, the terebinthinates, and sulphuric acid, either alone or with tonic decoctions, or the superacetate of lead with acetic acid and opium, are the most energetic. If it manifest itself chiefly in the *respiratory mucous membrane*, the astringent tonics, the mineral or vegetable acids, the inhalation of the fumes of astringent and tonic substances (see BRONCHI, § 100.), sponging the chest daily with tepid or cold astringent lotions, change of air, sea-voyaging, and horse exercise, are amongst the most salutary measures.

42. v. *Of the various constitutional and local diseases* with which debility is commonly associated (§ 25, 26.), little or no mention need be made at this place, as they are particularly noticed elsewhere. I may, however, remark that inflammations occurring in a debilitated and cachectic state of the frame, more especially if the debility be of that complicated kind described above (§ 11.), are characterised by deficient energy of all the functions actuated by the organic nervous system, and by imperfect tone of the vascular and capillary system itself (see INFLAMMATIONS—*Asthenic Forms of*); and that they seldom admit of the large depletions which are indispensable in the healthy or sthenic states of those diseases. The inflammations which not infrequently supervene in the course of adynamic fevers, and certain forms of erysipelas, as well as various other associations of the pathological conditions now under consideration, fully illustrate this position. Such asthenic forms of complicated disease, however greatly increased the general vascular action attending them may be, require the powers of life to be supported, and, in many cases, powerful tonics and stimulants to be exhibited, even at the time that it may be necessary to resort to local or derivative bleedings in order to prevent the disorganisation of the viscus especially affected. In all such maladies, the pulse is remarkably quick, often full, but soft and compressible — a state which, although resulting from depressed vital energy, is too generally viewed as evincing a very different condition; and depletions, often the very cause of the great frequency of the pulse, are resorted to, in order to render it slower — to perform an impossibility: the important pathological facts, that great quickness of pulse is the consequence of debility, and that the most tumultuous and morbidly increased vascular action is very frequently associated with the utmost depression of vital power, being either unknown or overlooked.

43. vii. *The treatment of the debility attending convalescence from disease* has been partly anticipated, particularly at § 36.; but I may here offer a few additional remarks on this important subject. — *a.* The great susceptibility of the system to impressions from external agents or mental emotions, attending the debility of the early stage of convalescence, should make the practitioner cautious as to its management. Exposure to cold, the premature exhibition of stimulants or of too heating tonics, too great indulgence of the appetite, and inappropriate food, may occasion relapses, may favour the supervention of other diseases, and may thereby superinduce dangerous or irremediable organic change. This is no infrequent occurrence after fevers, particularly the exanthematous, and after inflammations of the viscera. Such unfavourable results proceed not merely from the above causes, but also from inattention to the secretions and excretions; the patient often relinquishing too soon the use of those means which are still requisite to enable the weak powers of life to perform their various functions. The laying aside the use of medicines too soon is even still more frequently productive of mischief in convalescence from chronic diseases, particularly those of the bowels and liver, and dropsies. In these, the use even of the same means that removed the complaint is often necessary for a considerable time afterwards, either in different doses or in modified forms. During the whole period of recovery, the causes which produced the malady ought to be carefully avoided; and the physician should prescribe the diet and regimen of the patient, and such other measures as may seem to him calculated to ensure the object proposed. The articles of *diet* should at first be bland, digestible, and in small quantity, which may afterwards be gradually increased; and, with the returning powers, the farinaceous food first adopted may be added to weak animal decoctions, — or to milk, particularly asses' milk. Subsequently white fish, boiled; or chicken, rabbit, game, or the lean of well-fed mutton, may be taken, at first in small quantity and without heating condiments. Although white fish or flesh may not be more readily digested than game, venison, or mutton, yet they are generally not so heating as the last-mentioned article, or as beef. Before wine, or any other exciting beverage, be allowed, the effects of the gentle and tonic bitters, in the form of infusion, should be first observed; and if these occasion no febrile excitement, nor accelerate the pulse, a little old wine, particularly Hermitage, sherry, or East India Madeira, may be taken in water with the principal meal.

44. *b.* The *temperature* of the room, and the bed and body clothing of the patient, ought to be duly regulated according to his habits, and the peculiarities of the case, and with strict regard to ventilation. Subsequently, *change of air* and suitable *exercise* should be prescribed; at first in a close or open carriage, according to the season, and afterwards on foot, or on horseback; the last of which, and sea-voyaging, being the best suited to convalescents from pulmonary diseases.

45. vii. *Moral Regimen, and other means.* — *A.* There are various other remedies that may be resorted to in the more urgent cases of debility; but these are pointed out in the articles on the specific diseases, of which debility forms an important part. — *a.* The internal use of tar water, once so inordinately lauded, and subsequently so very undeservedly neglected, and medicated baths, may, however, be here noticed. I have had several oppportunities of observing the good effects of a course of tar water, or of an infusion or decoction of pine tops and shoots, in simple debility, and in complaints chiefly to be referred to this state of vital endowment. — *b.* The idea that

the skin is entirely incapable of absorbing fluids in which it may be immersed, has led to the neglect of *medicated baths*. But it should be recollected that, independently of any power of absorption this structure may possess,—and which I believe it possesses under some circumstances, and in respect of various agents,—it is a living, an active, a finely sensible, and, as to the nature and extent of its functions, an important organ; and that it is very susceptible of impressions by which not only its own functions are modified or altogether changed, but the actions of other organs are variously affected in consequence of the nervous and vascular connections and functional relations, which bind the different parts of the economy into one indivisible whole. Entertaining such views, I believe that cold, tepid, warm, or medicated baths; that lotions or washes, or stimulating liniments and frictions applied to the surface,—the former in slighter cases, the latter in the more urgent; are not infrequently beneficial in diseases of debility, when judiciously employed, and with due reference to antecedent or existing visceral disorder. Sea or salt water bathing; shower baths; camphor and chalybeate baths; warm, tepid, or cold baths, either general or local, of iodine, or of iodine and sub-carbonate of potassa; baths of decoctions of willow or oak bark, sometimes with the addition of an alkaline sub-carbonate; washes with camphor water, rose water, and vinegar, applied to the trunk; or sponging the surface daily with a mixture of these, at a temperature of about 60°; or with a small proportion of the nitric and muriatic acids in water at a temperature of 70° to 80°; are respectively of much service, when suitably prescribed.

46. *B. Moral treatment*, or attention to such mental impressions and emotions as are calculated to promote the physical means resorted to, is particularly beneficial in restoring the vital powers, especially when the nervous systems manifest a more than ordinary share of depression and its attendant disorders. The manner and bearing of the physician, when calculated to inspire *confidence*, will of themselves do much in fulfilling the intentions of his prescriptions. The faith reposed in the remedies resorted to will often accomplish as much as they are physically capable of performing, and not infrequently much more. In order to inspire this feeling, the physician should himself evince a calm, and, in cases of great danger and depression of the vital energies, a cheerful confidence. Hope, in whatever form it may be excited, and in every degree to which it can be elevated, is a most powerful agent in combating diseases of debility; whilst its opposite, despondency,—the consequence and the cause of debility,—is one of the greatest evils we have to guard against in these maladies. Every practitioner whose range of observation has comprised the malignant diseases of warm climates, or of temperate countries, must have remarked, that when the patient dreads, and still more if he entertains a sentiment of, an unfavourable issue, or if he be apathetic and careless of the event, the very worst sign of depressed vital power has appeared, and the most active moral and physical stimulants are then required; whilst, on the other hand, a firm confidence in the physician, and ardent desire of recovery, are the best aids by which his endeavours can be seconded.

47. *C. Travelling*,—owing to the exercise, the change of air, the continued succession of novel and exciting objects presented to the senses, the agreeable occupation, without exhaustion of the mind which attends it, and the amusing and exhilarating matters incidental to it,—is one of the most efficacious means of restoring the depressed or exhausted powers of the frame, especially the enfeebled functions of the digestive organs and of the nervous system; and nearly allied to it, are *pleasant society*, rational *amusements*, and varied, interesting, but not fatiguing, bodily and mental *employments*.

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DEGLUTITION, DIFFICULT.—Syn. *Dysphagia* (from δὺς, *difficulty*, and φάγω, *I eat or swallow*). *Deglutitio difficilis vel impedita*, Auct. *Schweres Schlingen*, Ger. *Dysphagie*, Fr. *Dysphagy*. *Difficulty of Swallowing*.

Classif.—1. *Class*, Diseases of the Digestive Function; 1. *Order*, Affecting

the Alimentary Canal (*Good*). SPECIAL AND GENERAL PATHOLOGY; *Symptomatology* (*Author, &c.*).

1. Difficult or obstructed deglutition is an occasional symptom of several diseases, and a constant concomitant of a great variety of organic changes, affecting the *fauces*, the *pharynx*, the *œsophagus*, or parts in their immediate vicinity; and which are discussed under these heads, particularly in the article on the ŒSOPHAGUS. After having noticed the only *idiopathic form* in which dysphagy can strictly be said to occur, I shall arrange those pathological states of which it is an important phenomenon, and with reference to the places in which they are more appropriately described, and to the principles and means of cure.

I. PRIMARY OR IDIOPATHIC DYSPHAGY. *Nervous Quinsey*, HEBERDEN.

CLASSIF.—II. CLASS, I. ORDER (*Author*).

2. DEFIN.—*Difficulty of swallowing, occurring suddenly, and accompanied by a choking sensation.*

3. i. This form of dysphagy is not infrequently observed. It generally takes place when the patient is apparently in good health; and chiefly in irritable, nervous, or weak constitutions. It is usually induced by violent gusts of temper, or mental emotions, or by dread of its accession; and is occasionally so severe as to threaten suffocation. When it affects the œsophagus, it gives rise to a sensation resembling that occasioned by the retention of an extraneous body; and matters attempted to be swallowed are either retained for some time, or rejected. When the pharynx is principally affected, deglutition is generally attended by a sense of choking. It may continue only for a minute or two, or it may be prolonged for several days, or even months, difficulty being present in various degrees upon each attempt at receiving substances into the stomach; or it may be remittent. It is often accompanied by the retention of flatus in the œsophagus, probably by spasm; the difficulty of deglutition being increased by the flatulent distension, but removed upon the discharge of flatus. It resembles in this the globus hystericus; but it differs from hysteria in the circumstance of its occurrence in males as well as in females, and independently of any of the other characteristic symptoms of that affection.

4. ii. The TREATMENT of primary or idiopathic dysphagy should be directed with the view, 1st, of relieving the existing difficulty; and, 2dly, of preventing its recurrence.—(*a*) The first object may be attained by swallowing slowly cold or iced fluids; by cold applications to the neck or throat; by cathartic, anodyne, and antispasmodic enemata; and by camphorated liniments, or antispasmodic and anodyne plasters placed on the sternum or throat. (*b*) The recurrence of the affection will be prevented by the internal use of vegetable bitters and tonics, with the alkaline sub-carbonates; by narcotics or antispasmodics combined with ipecacuanha; and by a free action kept up for some time on the lower bowels, by means of the resinous or other purgatives conjoined with vegetable bitters, and promoted by clysters. The other means, mentioned hereafter (§ 16.) will also prove useful adjuvants.

II. SYMPTOMATIC AND COMPLICATED DYSPHAGY. CLASSIF.—GENERAL PATHOLOGY; *Therapeutics*, &c.

5. Difficult or obstructed deglutition is an occasional or constant attendant upon a variety of functional disorders, and of organic changes. 1st. It is often symptomatic of hysterical, hypochondriacal, flatulent, and asthmatic affections. 2d. It is constantly attendant upon tetanus and rabidity. 3d. It is sometimes produced by organic change seated in parts about the base of the brain or cranium, the medulla oblongata, or upper part of the spinal chord. In all these symptomatic states, the parts immediately concerned in the function of deglutition are seldom, and not necessarily, affected organically: but in the following there always exists either inflammatory action, or its consequences, or some structural change, in the parts by which food is conveyed into the stomach, or in their immediate vicinity. The preceding may be called *symptomatic forms* of dysphagy; those which are to follow, *complicated states* of this affection. Under this latter may be arranged, 1st, Dysphagy from congenital malformations; 2dly, From inflammation, or structural lesions of the mouth, tongue, fauces, pharynx, or tonsils; 3dly, From diseases of the epiglottis or larynx; 4thly, From inflammations or structural lesions of the œsophagus, or of the cardiac orifice of the stomach; 5thly, From tumours pressing upon the pharynx, or on the œsophagus. On each of these I shall add but few remarks.

6. i. SYMPTOMATIC OR SYMPATHETIC DYSPHAGY.—*A. Of spasmodic or flatulent diseases.* Difficulty of swallowing occasioned by *hysteria*, *hypochondriasis*, spasmodic *asthma*, *dyspepsia*, and even *rabidity*, is in a great measure to be ascribed to a flatulent distension of a portion of the œsophagus, with spasmodic constriction of other parts of this tube, and disposition to convulsive or spasmodic action of the muscles of the pharynx, either upon certain occasions of their being excited by the mind, as in hydrophobia, or upon attempts at performing their usual functions. In many instances, particularly those connected with asthma, indigestion, or flatulence of the digestive canal, the difficulty is attributable rather to the ascent of flatus in the œsophagus, preventing the transmission of food into the stomach than to spasmodic action of the muscular parts concerned in the process. In these cases, the patient feels much pain, with a sense of distension or pressure under the sternum, and in the course of the œsophagus after swallowing.

7. *B. Dysphagy may be occasioned by structural lesion about the base of the brain or cervical portion of the spinal chord*, or about the base of the cranium. In such cases, the paralysis may be more or less complete; and it may be limited to the muscles of the pharynx and upper part of the œsophagus (BONET, PORTAL, BALDINGER, and myself), or it may have extended to them from other parts. Numerous cases illustrating these positions have been recorded. The participation of the muscles of deglutition in either general or partial paralysis is very commonly observed in apoplexy, &c.; and the occurrence of this form of dysphagy, independently of organic change, or rather from *congestion* about the base of the brain, is shown by its occasional accession in the advanced stages of fevers. Paralysis of the muscles concerned in this function may also be produced by wounds of the nerves of the face (PALLETTI), by

lightning (Paterson), and by severe cold (Bleuland). It is, however, most frequently caused by the slow developement of tumours, or cysts, or other structural changes about the base of the cranium, whereby either the nerves supplying these muscles are compressed at their origin or in their course, or a portion of the brain or of the upper part of the spinal chord is injured.

8. ii. Complicated Dysphagy, or difficult deglutition from structural change affecting the parts immediately concerned in this function, comprises a great variety of lesions. I shall merely enumerate them with reference to their seat; their nature, morbid relations, and treatment, being fully discussed under more appropriate heads.

9. *A. Dysphagy from congenital malformation.*— Extreme smallness, or enlargement of the *tongue;* the termination of the pharynx, or of the œsophagus, in a cul de sac, or obliteration of the œsophagus; the division of this part into two canals, and its communication with the trachea; are the chief malformations which interrupt deglutition; and are of very rare occurrence in otherwise well-formed infants. Cases, however, have been recorded by Blaes, Van Cuych, Michel, Billard, Martin, A. Cooper, and Andral. In these, death, necessarily resulting from inanition, took place in from three to nine days. A slight interruption to deglutition very frequently arises from congenital fissures of the soft and hard palates.

10. *B. From diseases of the mouth and throat.*— (*a*) Inflammation or chronic enlargement of the *tongue;* ranula; sublingual calculus (Guenther); and aphthæ, ulceration, tumours, and excrescences about the base of the organ (Reidlin, Van Swieten, Tode, and Inglis); are not infrequent causes of dysphagy. Cases of chronic enlargement of the tongue, impeding deglutition, unconnected with malignant disease, and continuing for many years, are recorded by several writers. I have seen an instance of this kind, that had existed from infancy to nearly middle age. These and other affections, with the treatment appropriate to them, are particularly noticed in the article upon the *Diseases of*, and the *Indications furnished by, the* Tongue.—(*b*) The *fauces* and *tonsils* not uncommonly occasion dysphagy. Inflammation, suppuration, ulceration, or destruction of the soft *palate*, or of the *uvula;* great relaxation of the latter part; inflammation, abscess, chronic enlargement, and ulceration, of the *tonsils;* fungous and other tumours and polypi of the maxillary sinus, or posterior nares; various tumours or excrescences attached to the palate or tonsils (Schmidt, Thilenius, &c.); and the severe effects of mercury, or the sudden arrest of salivation; are generally attended by more or less of dysphagy.—(*c*) When the *pharynx* is the seat of inflammation or of its consequences, or of the lesions now enumerated, or of malignant disease (Kergaradec, and myself), deglutition is commonly much more impeded than when only the fauces are affected; and in some instances it is extremely difficult or nearly impossible. In such cases, the epiglottis and larynx are more or less irritated, and, by the consequent disorder of the respiratory actions, the dysphagy is still further increased. Foreign, and particularly pointed or sharp, bodies lodged in the pharynx, are also sometimes causes of dysphagy.

11. *C. Dysphagy from disease of the epiglottis and larynx.* — (*a*) Inflammation, ulceration, and entire destruction of the *epiglottis*, or induration, incurvation, and the removal of it by wounds, will occasion difficult deglutition, as in the cases recorded by Maynwaring, Schurig, Bonet, Desgranges, Tonanni, and Larrey. (*b*) Also inflammation and ulceration of the *larynx*, ossification of its ligaments, and displacement of the *os hyoides*, are generally attended by dysphagy. The possibility of the occurrence of this last cause, although observed by Valsalva, and Mollinelli, has been doubted; but the instance of it noticed by Sir C. Bell (*Surg. Observ.* p. 160.), and the case wherein it was caused by swallowing a large hard substance, recorded by Dr. Mugna (*Annali Univers. di Med.* Nov. 1828.), put the matter at rest. Fracture of this bone by external violence has produced not only an impossibility of deglutition, but even more serious consequences, as shown in the cases published by Dr. Marcinkowski and M. Lalesque (*Journ. Hebdom. &c.*).—(See Larynx — *Diseases of*.)

12. *D. Diseases of the œsophagus, and cardiac orifice of the stomach*, will impede or altogether obstruct deglutition. Inflammations and their consequences, as softening and ulceration, induration, thickening, stricture, and purulent collections between the coats of these parts; also partial dilatations, sacs and diverticula, or even large pouches, either with or without thickening and stricture of the part of the œsophagus immediately below the dilatation (Blasius, Haller, Meckel, Monro, Ludlow, C. Bell, Odier); polypous or fungous excrescences or tumours of various kinds in some portion of this canal, or in the cardiac orifice of the stomach; or scrofulous, callous, cartilaginous, osseous, carcinomatous, or scirrhous degeneration of these parts; or merely enlargement or ulceration of their mucous glands; and spasm, rupture, or perforation of the œsophagus, or the lodgment of foreign bodies in it; are severally causes of dysphagy; and are fully described in the articles on the *Pathological Anatomy* of the Digestive Canal; and on the *Diseases of the* Œsophagus, as well as in those of the Stomach.

13. *E. Tumours pressing upon the pharynx, or upon the œsophagus,*— as bronchocele, or other tumours or abscesses near the throat and in the neck; tumefaction of the lymphatic and secreting glands below the jaw, and at the top of the sternum; aneurism of the subclavian or carotid arteries, or of the aorta before it passes into the abdomen; enlarged bronchial glands, tumours of various kinds, and abscesses in the posterior mediastinum; exostoses or other diseases of the cervical vertebræ, and purulent collections between them and the œsophagus (Carmichael, myself, and others); also abscesses formed between, or involving, the trachea and œsophagus (Hay and myself); dropsy of the pericardium (Bang); and enlargement of the liver; have severally been observed to occasion dysphagy.

14. iii. The Diagnosis of dysphagy requires a few observations merely. — (*a*) In *idiopathic*, as well as in the *sympathetic* dysphagy, the difficulty takes place suddenly, disappears as suddenly, re-

mits or intermits, and is generally attended either by convulsive efforts, by choking sensations, or by flatulence, dyspepsy, or various nervous symptoms, particularly when it is connected with hysteria, hypochondriasis, &c. — (*b*) In cases of atonic or *paralytic* dysphagy, solids are more easily swallowed than liquids; but the process is often very slow, and the difficulty great. — (*c*) When it proceeds from disease of the *fauces*, the cause is obvious to the sight; and frequently also when it is induced by the state of the *pharynx*. In this latter case, as well as in dysphagy from lesions of the *epiglottis* and *larynx*, or from tumours or fungous excrescences developed in, or pressing upon, the pharynx, or from inflammatory diseases of it, or of the upper part of the œsophagus, substances are often forcibly ejected into or through the nostrils, upon attempts at deglutition, owing to the spasmodic action of the muscles of the pharynx.— (*d*) When dysphagy is caused by a diminution of the canal of the *œsophagus*, either from thickening of its parietes, or from tumours pressing upon it, &c., difficulty of swallowing solids is first felt, and this at last is followed by a difficulty of swallowing fluids; the interruption to this function proceeding gradually and slowly. When the obstruction is seated low in this tube, or about the cardiac orifice of the stomach, pain is usually felt under the sternum after swallowing: and the matters are afterwards regurgitated into the mouth, owing either to a sudden reaction of the parietes of the canal, or more commonly to their inverted peristaltic action. (See art. ŒSOPHAGUS—*Diseases of*.)

15. iv. TREATMENT. — It must be evident that the treatment of sympathetic and complicated dysphagy should be conducted strictly according to the pathological state on which it depends, as far as that may be ascertained. Hence a tolerable knowledge of the means applicable to it, in every circumstance in which it presents itself, is to be acquired only by a reference to the articles where the various lesions occasioning it are described, in respect of their nature and cure.

16. *A. Sympathetic dysphagy* — (*a*) of *spasmodic* or *flatulent* disorders, requires very nearly the same treatment as already recommended in the idiopathic form of the disease. If it accompany *hysteria*, swallowing, slowly, cold or iced fluids, and cold applications to the neck, will soon afford relief; but it will afterwards be necessary to have recourse to tonics and cooling aperients, with other means suited to the peculiarities of the case. The instances in which TODE and WICHMANN found quassia so beneficial, were probably of this kind, or the idiophatic form already noticed. — (*b*) When dysphagy is connected with *flatulent dysphagy*, or with *asthma*, or *palpitations* of the heart, relief will generally be obtained from anodynes or antispasmodics combined with refrigerants, or from vegetable tonics with alkaline sub-carbonates and aperients. Blisters, or rubefacient plasters, or either of the ammoniacal, the compound galbanum, or the cummin plasters, with opium or the extract of belladonna, applied over the sternum or throat, will also materially assist the internal remedies. HEINECKEN advises the preparations of *zinc*, which, as well as the oxide of *bismuth*, may be tried in this form of dysphagy. He also recommends the distilled water of the *laurocerasus*, for which the *hydrocyanic acid* may be substituted with advantage. Besides these, the *cuprum ammoniatum*, the preparations of camphor with those of henbane or conium, may also be exhibited. In every form of dysphagia not depending upon organic change, purgatives, and cathartic and antispasmodic enemata, will be productive of more or less benefit.

17. (*c*) Dysphagy from *paralysis* or atony of the muscles of deglutition should be treated according to the principles stated in the article PALSY. If it be occasioned by congestion about the base of the brain or spinal chord, general or local bleedings, active cathartics, and external derivatives, must be employed. Congestion having been removed, large doses of camphor, as advised by HOFFMANN; stimulating linctuses and gargles; sialagogues; electricity and galvanism; exciting liniments or blisters to the neck or throat, as suggested by LOEFFLER; as well as moxas and issues; may be severally employed. Dr. BARTON recommends the *zanthoxylum* in cases of this description. THUNBERG and BALDINGER advise the cajeput oil to be rubbed on the neck; GARDANNE, *sinapisms* to be applied on the same part; and FRANCK, the *actual cautery*.

18. *B. Dysphagy from organic change* of the parts directly concerned in the function of deglutition requires means the most diversified, according to the nature of the lesions to which it is attributable. — (*a*) When it is *congenital*, but little can be done excepting in the slighter forms occasioned by cleft palate, or by adhesion of parts within the mouth. In these, the expert surgeon may afford complete relief.— (*b*) Difficult deglutition from diseases of the *tongue*, *fauces*, *tonsils*, or *larynx*, is of itself of minor importance; but as respects the primary lesion, of the utmost moment, requiring the most energetic measures pointed out in their treatment. (See these articles.). — (*c*) Dysphagy from *inflammations*, or their usual *consequences*, whether seated in the *pharynx*, the *œsophagus*, or the *cardiac* orifice of the stomach, should be treated according to the sthenic or asthenic form they may assume. After general or local depletions, especially cupping between the shoulders or over the sternum, emollient, cooling, and febrifuge linctuses ought to be taken at short intervals. I have prescribed, with advantage in such cases, especially when ulceration has been suspected to exist, linctuses containing the nitrate of potash, or the muriate of ammonia, or the sub-borate of zoda, or the subcarbonates of the fixed alkalies with the nitrate of potash and ipecacuanha, in addition to the other means described in the articles on the diseases of these organs. When foreign bodies are lodged in the pharynx or œsophagus, appropriate measures should be resorted to, either for extracting them, or for pushing them onwards into the stomach.— (*d*) When dysphagy is occasioned by *tumours developed in, or pressing upon, the œsophagus* or *cardia*, it is not always that their nature, or even their existence, can be fully ascertained. If their presence be inferred, or when they are developed in external parts, or if the diathesis be scrofulous, then iodine may be prescribed internally as well as externally, with potash, conium, &c.*

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* I was consulted, in 1826, in the case of a young lady born in India, but who had resided some years in London. The glands in the neck, and underneath the sternal ends of the clavicle and sterno-mastoid muscles (as well

If *abscesses* have formed between the upper part of the œsophagus and cervical vertebræ, or between the former and the trachea, or about the pharynx, an unfavourable issue might possibly be averted by incisions made into them. If *aneurisms* press upon the gullet, the treatment recommended when discussing *Diseases of the* Arteries should be put in practice. — (*e*) When *thickening of the parietes* of a portion of the œsophagus, with more or less of *stricture* or *scirrhus* of this canal, or of the *cardia* of the stomach, is the cause of dysphagy, cupping, or leeches applied over the sternum; issues and moxas in the same situation, or in each side of the neck; the linctuses recommended above (§ 18. *c.*); mercurial and other alteratives, with conium, hyoscyamus, camphor, &c.; the iodide of mercury, or the hydriodate of potash, internally and externally; the sub-carbonates of the alkalies, or the liquor potassæ in emollients, &c., with various other means noticed in the article on the Œsophagus, may be employed. If these fail, a careful trial may be made of the bougie; but the utmost attention should be paid not only to the manner of using it, but to the effects produced by it; for if the stricture be connected with sacs, pouches, or diverticula, or hernia of the inner coats through the muscular, or even with simple ulceration,—changes which not infrequently take place in the part immediately above the strictures —much mischief may result from even a cautious introduction of a bougie. The frequent and obvious connection of dysphagy with scrofula shows the propriety of prescribing the medicines found most serviceable in that disease, particularly when occurring in the scrofulous diathesis: and in such cases, the muriate of lime or of barytes, conium, liquor potassæ, and especially the preparations of iodine, should be fully tried.

19. *C.* The treatment advised by the best writers on this and its related affections consists of much that has been now stated; in addition to which, however, I may briefly add, that, the *muriate of baryta* has been recommended by Kerksig; *cold and iced fluids,* by Tode and Montat; *conium,* by Wichmann, Collomb, Hufeland, and Johnston; *hyoscyamus,* by Withering; *opiates,* by Ferrein and Conradi; the *liquor potassæ,* by Haller; *emetics,* by Ferrein; and *local bleedings,* by Franck and Bang. *Calomel* and some other preparations of *mercury* have been prescribed by Sequira, Stevenson, Engelhard, Brandis, and others,— to the extent of producing salivation, by Kramp, Munckley, Brisbane, and Farquharson—in the form of mercurial ointment, either alone or with the volatile liniment, rubbed over the sternum and throat, by Dobson, Patten, Kerksig, and Wathen — internally, with antimony, by Van Geun — and with aloes and camphor, by Haller, Patten, Bang, and Brandis, who contend strenuously for the occasional origin of dysphagy in suppressed rheumatism and repelled eruptions, and also recommend external derivatives and irritants, as sinapisms, issues, setons, blisters, repeated or kept open, &c. The *surgical measures* to be resorted to in various circumstances of the disease are fully discussed in the writings of J. Hunter (*Trans. of a Soc. for the Imp. of Med. and Chirurg. Knowledge,* vol. i. art. 10.), Desault (*Surgical Works, &c.*), Richter (*Chirurg. Biblioth.* b. xii. p. 11.), C. Bell (*Surgical Observ. &c.*), and S. Cooper (*Surgical Dictionary, &c.*).

20. *D.* The *diet* should be chiefly farinaceous, excepting in the nervous and spasmodic forms of the disease; and it ought always to be easy of digestion, and taken without any heating condiments. All substances which irritate or excite by their direct or indirect action, are injurious. The stomach also should never be loaded; and, in every circumstance, the secretions and excretions ought to be carefully regulated and promoted by gentle and appropriate means.

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DELIRIUM.

— Syn. *Paraphrosyne, Paraphronia* (from παρα, erroneously, and φρονέω, I understand), Auct. var. *Paracope,* Swediaur. *Irvereden, Aberwitz,* Germ. *Délire,* Fr. *Delirio,* Ital.

Classif.—Pathology; *Symptomatology.*

1. Delirium has been defined: —*Disorder of the intellectual powers, with or without derangement of the moral sentiments.* But this definition is too extended and vague, and embraces the whole circle of mental diseases. J. Franck, and some

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as in various other parts of the body), were so greatly enlarged as to impede deglutition and respiration. She had been treated by several eminent practitioners; but the tumours had increased. In consultation with Mr. Annesley, who had requested me to see her, a course of iodine was recommended; and the hydriodate of potash was employed, chiefly internally, for eight or nine months, with occasional intervals not exceeding a fortnight each. The glandular enlargements gradually subsided, the catamenia appeared, and she perfectly recovered. She is now well, and married.

other pathologists, have restricted it by adding — *this disorder assuming an acute form.* Several writers, retaining the preceding extended definition, have divided delirium into the *acute*, and the *chronic*; the former consisting of various morbid states of the brain, attended by mental disturbance and fever —the latter of mental alienation, unattended by fever or active bodily disorder. *Chronic delirium*, therefore, comprises all those states of disordered mental manifestation treated of in the article INSANITY. *Acute*, or *febrile delirium* refers to those morbid affections of mind supervening in the course of febrile, inflammatory, and some chronic diseases, and which have been denominated *symptomatic*, or *sympathetic delirium;* and those which are produced by acute diseases, or injuries of the brain or its membranes, and by intoxicating or narcotic substances; and which have been termed *idiopathic delirium* by some writers. The common acceptation of the word delirium, and that in which it has been used by the best authors, accords with the acute form as occurring in the manner now stated; and in this light I shall also view it. But it is more doubtful in how far it is ever an idiopathic affection. Indeed, in many of the diseases in which it is admitted by all to be a symptomatic or sympathetic disorder, its more immediate dependence upon a morbid state of vital endowment and circulation in the encephalon is as manifest as in some of those which have been viewed as idiopathic. The distinction, therefore, cannot be maintained, especially as it appears to have been founded upon a mistaken idea, viz. upon the supposed existence, in the reputedly idiopathic form, of inflammatory irritation or action of the brain or its membranes; which action does not obtain in the other. That delirium is most frequently occasioned by such a pathological state, cannot be doubted; but it is equally certain that it sometimes also proceeds from a different condition; and that either of them — either inflammatory action, or simple disturbance of the cerebral functions without inflammation — may exist in each of the divisions thus distinguished,— in the idiopathic, as well as in the sympathetic form. If the distinction in question be still retained, it would be more accordant with the generally admitted acceptation of the word idiopathic, to consider, as J. FRANCK has done, all the manifestations of delirium as symptomatic, excepting when it is occasioned by intoxicating and narcotic substances: but, when it proceeds from inflammation of the brain or its membranes, whether primarily or consecutively induced, to view it merely as a symptom, but by no means a constant, although a very general symptom, of this state of disease.

2. Delirium, as well as other cerebral affections, has been too generally imputed to inflammatory action; and the state of the ganglial or organic nervous power, which evidently influences both the functions and the circulation of the brain, has been entirely overlooked, particularly as respects this affection. There can be no doubt of the difficulty of appreciating correctly the nature or extent of the disorder which this part of the system experiences. But this circumstance surely does not preclude us from tracing ultimate phenomena to their true origin, instead of stopping at intermediate effects; nor from inferring, from the nature of these phenomena, and of the causes which increase or remove them — from the *juvantia* and *lædantia*—certain general conclusions respecting the condition of that power whence morbid conditions primarily emanate; each successive effect being the cause of further change, until organic lesion, and ultimately death, result. Believing, therefore, on physiological grounds, that delirium is often the consequence of changes in the state of organic nervous power —of the functions of that part of the organic or ganglial system supplying the encephalic organs— influencing, in some cases, one or more of the mental manifestations, without any appreciable change of vascular action or of structure; in others, both function and circulation; and in many, not only function and circulation, but organisation also; and that our knowledge of these changes, of their signs, and of their various related circumstances, are too imperfect to enable us to come to accurate conclusions; but that we should proceed nevertheless with the aid of the dawn of knowledge now opening upon us; I shall briefly consider, first, the phenomena and diagnosis of delirium— afterwards, its pathology and treatment conformably to the doctrine now alluded to.

3.i. PHENOMENA.—*A.* The *invasion* of delirium is generally preceded by sleeplessness, headach, vertigo, heaviness of the head, noises in the ears, change of voice, absence of mind, forgetfulness of pain, by an air of surprise, and acuteness of the senses; the eyes are brilliant, and intolerant of light; the head is often hot, the face flushed, and the circulation of the brain more or less increased. In some cases, however, these symptoms are either altogether absent, or inappreciable; and in others the countenance is collapsed, pale, and cool, and the eyes sunk. To the foregoing phenomena succeed those which constitute delirium, and which vary remarkably in character and intensity. In many cases, particularly when there are few or no signs of augmented determination of blood to the head, a simple agitation or merely absence of the mind, or reverie, or wandering from the objects before it, or a slight incoherence in the ideas, is all that is observed; but, from this slight state of affection, we meet with every grade and form of mental disorder — sometimes with fright, visions or *illusions*, often connected with present objects; occasionally with *hallucinations*, or the reproduction, in confused or unconnected forms, of previous impressions;—in certain cases, with the most furious mental and physical agitation; in others, with the greatest depression and the most sombre taciturnity;—in one case, with tears and signs of great mental distress; in another, with a lively but incongruous current of ideas, or even with laughter and gaiety.

4. *B.* Delirium is frequently *present* at first only during the intermediate states between sleeping and waking, which patients in acute diseases experience; the mind still perceiving objects, but imperfectly. In this state the patient appears to dream aloud; and when fully awakened, returns rational answers to questions put to him; but he soon lapses into a state of dreamy incoherence, or into that of more complete delirium. This condition nearly approaches that of *coma vigil*, into which it often passes. In some instances, this state is characterised by a loss of recollection of all objects observed, and of all ideas with which the mind had been stored during the greater period

of life, and by the recovery of the memory of languages and of ideas acquired at a very early age, and long forgotten. Thus old persons, when delirious, although their minds are blanks as respects every thing present, or which have become known to them from youth or manhood, will talk of matters which had interested them previously to such periods, and sometimes in a language which they had then spoken, but of which objects and language they had no recollection long before their delirium, nor retained any after their recovery. Here, again, the remarkable similarity between several manifestations of delirium and dreams is strongly evinced; the objects and ideas about which the unconscious mind is engaged in the states of both delirium and dreaming being frequently those which had made a vivid impression in youth, which had become erased by the cares and employments of life, but which are recalled during certain conditions of the brain. The production of these in incongruous forms, and the giving utterance to the morbid conceptions formed of them, constitute *hallucinations;* whilst, owing to the nearly inconscious state of the mind, the imperfect and erroneous impressions made by surrounding objects on the senses of the patient, give rise to inconclusive and unconnected conceptions, in consequence of the morbid condition of the brain, and occasion the *illusions* characterising the delirious affection.

5. In addition to disorder of the mental powers, the organs of locomotion are remarkably affected. In the low or quiet delirium, and in the less dangerous states, in which the brain is only functionally deranged, the muscles are either somewhat agitated, or very much enfeebled, and the voice is very weak or nearly lost. In more severe cases, the voice and the muscular force are greatly increased; the patient, however, sinking into a state of profound collapse after a few violent efforts. In the most dangerous form of delirium, particularly when it proceeds from organic disease of the brain or its membranes, it is attended, but more frequently followed, by general convulsions, by spastic contractions of one or more of the voluntary muscles, by entire loss of consciousness and sensibility, or by paralysis.

6. *C.* Delirium, as M. Georget has remarked, may be *continued* or *intermitttent*, even in the continued affections of the brain. When it is intermittent, it usually returns with the exacerbation of fever that takes place in the evening and night. When the patient recovers his reason, he is generally weak and exhausted; his senses are readily and painfully impressed by their respective stimuli; and he complains of thirst, and pains of the head and limbs. If the delirium has been slight, and consciousness has not been entirely abolished, he retains more or less recollection of what had passed during its continuance. But when it has been intense, or of some duration, he has no knowledge of what has occurred. The *epidemic* appearance of delirium mentioned by Quelmalz (*De Epidem. Mentis Alienatione.* Lips. 1752.) and Michaelis (*Med. Pract. Biblioth.* b. i. st. 1.) is to be imputed to the prevalence of those diseases in which delirium is apt to supervene, and especially in that form on which it is most frequently an attendant. The *duration* of the paroxysm of *intermittent* delirium varies from one to several hours; but the *continued* form, particularly when occasioned by disease within the head, may last several days, or even many weeks. Sometimes, as in the more severe cerebral cases, it alternates with profound coma. When it terminates fatally, it generally passes into coma; but in some instances the patient recovers his reason for a few hours before dissolution.

7. ii. Diagnosis.—It is of the utmost importance that delirium should not be mistaken for *insanity*, and especially that the delirious patient should not be removed to an asylum for the insane. On two occasions I have seen such a mistake made, and about to be acted upon, when my opinion was requested. But these cases recovered perfectly: to one of them — a professional man — the removal to an asylum, or the supposition even of being insane, might have been ruinous. There can be no doubt that delirium often passes into insanity, especially when it has been caused by inflammatory states of the brain, and by fevers with determination to the part; or when it occurs in persons hereditarily predisposed to insanity; but until it has assumed the features of that form of mental disorder, it certainly in no respect should be viewed and treated as such.

8. The causes and circumstances originating *delirium* are often of themselves sufficient to show its difference from insanity. Its occurrence in the advanced stages of acute diseases, or of chronic maladies when the powers of life have become exhausted and febrile action of an acute kind has supervened, is especially characteristic of delirium. The *insane* patient has all his senses, as well as his digestive, assimilative, and locomotive powers, but little or not at all impaired. His mental faculties and intelligence are also but partially deranged. M. Georget has very justly remarked that the mental disorder of the insane is often confined to a single faculty; and even in the most extended, or maniacal affections, the faculties are rather perverted, or insulated, and without the bond of association, rather than extinguished. The most maniacally insane person wills and reasons, and is not always absurd in his actions. But in the delirious, all the cerebral functions are severely affected. His sensations are imperfect and incorrect, his ideas unconnected, his passions disordered, his voluntary motions irregular, feeble, and defective; his intelligence and recollection nearly abolished; and he is impassive to all that surrounds him. Whilst the *delirious* patient presents many of the physical signs of exhausted vital energy, or of the gravest state of disease, the *insane* has all the appearances of unimpaired health, particularly in the early stages of insanity, and before consecutive organic change has taken place. In the former, the sensations and perceptions are more or less abolished; in the latter, they are but little or not at all impaired, — the judgment only, or conviction of the understanding respecting them, being erroneous. The false conviction of the insane is too strong to be removed by the evidence of the senses: the sensations and perceptions of the delirious are always too weak, even when consciousness is partially present, to become the basis of sound

conclusions. Hence the insane person cannot be convinced by objects seen, heard, and understood by him, in opposition to his perverted judgment respecting them; and the delirious patient perceives objects so faintly, if he perceives them at all, as to be unable to distinguish between such as are in any respect similar, or to recognise one person from another. Besides the circumstance, also, of delirium being generally an *acute*, and insanity a *chronic* affection, it may be remarked, that in the former, when occurring from inflammatory states of the encephalon, or from fevers complicated with such states, the return to the healthy function is often so slow as to occasion fears of the supervention of the latter. In some instances, however, the restoration from febrile delirium has been quick, and the mental manifestations have become even more active than previously to the seizure.

9. iii. PATHOLOGY. — It is of the utmost practical importance to distinguish the different forms of delirium, particularly in respect of the grade of vascular excitement and vital power, and the existence or non-existence of inflammatory action, for, without such a step is previously taken, no rational method of cure can be adopted. I shall therefore attempt to make this distinction.

10. *A. Delirium attended by exhausted nervous and vital influence* is sometimes occasioned by excessive hæmorrhages or venæsection, by inanition, prolonged lactation, and profuse seminal or other discharges, by old age, hysteria, fear, &c. It also occasionally supervenes from exhaustion in the last stages of some acute and chronic diseases, or from whatever directly or indirectly depresses the powers of life, as shown in the article DEBILITY. In many such cases, however, although the vital energies are sunk, yet the brain is more or less excited relatively to the other parts of the body; and in some, the state of delirium is connected with an impure or contaminated condition of the circulating fluids, particularly when it occurs in the advanced course of malignant diseases. The delirium, also, which is caused by excessive pain, by capital operations, by the suppression of the appearances of pain or suffering, or by the apprehension of the consequences of operations, and which M. DUPUYTREN has very appropriately denominated *nervous delirium*, chiefly falls under this form of the affection; and to it may be added many of the instances of delirium caused by excessive irritation in remote but related organs or parts, as consumption, ulcerations of the bowels, worms, &c. Although it is often obvious that a relatively increased determination of blood to the head exists in some cases of this form of delirium, yet it may be inferred, with equal justice, that a deficient supply of blood to the brain obtains in others. This conclusion may be legitimately drawn from the pale, cool, shrunk features, sunk eyes, the weak and small pulsation of the carotids, the effects of various kinds of treatment, and the absence of increased or even common vascularity of the brain upon examination after death, in some cases of this form of delirium. This opinion has been supported by M. GEORGET and several other pathologists, without having been imputed by them to its obvious source, *viz.* exhausted power of the organic nerves supplying the vessels of the brain.

11. *B. Delirium characterised by depressed or exhausted vital power, and morbidly excited vascular action*, is by far the most common form; and is very frequently observed in the advanced progress of continued, remittent, intermittent, malignant, and exanthematous fevers; of acute inflammations; and of several chronic diseases, particularly when they pass into the acute form. It may also be occasioned by any of the narcotic or acro-narcotic poisons, or from their exhibition in enemata; and in some temperaments and constitutions, by a small quantity of those in common use, — as by opium, stramonium, belladonna, &c. I have more than once seen it produced even by the preparations of hop and hyoscyamus taken in moderate doses. Its occurrence from the medicinal exhibition of various narcotic and poisonous substances is noticed by various writers; — from cicuta, by WEPFER and SMETIUS (*Miscell.* p. 569.); from belladonna, by PELARGUS and VALENTINI (*De Maniacis ab Usu Bellad. &c.*); and even by the superacetate of lead, by STOLL (*Rat. Med.* par. vii. p. 317.) and KNIGHT (*Lond. Med. and Phys. Journ.* vol. iv. p. 286.). — DIOSCORIDES (*Mat. Med.* l. iv. cap. 63.), WESTPHAL (*Pathol. Dæmoniaca*, p. 33—36.), and HORN (*Archiv.* Nov. 1811, p. 540.), have noticed the occurrence of delirium from hyoscyamus exhibited in clysters. Poisoning by various substances, as the Lolium temulentum, and some of the narcotics just mentioned, generally occasions delirium. It may also arise from indigestible substances taken into the stomach. In all these cases, in addition to the states of the system connected with the appearance of this affection, there is generally increased excitement of the circulation in the brain, relatively to that in the rest of the body; and not infrequently an impure or altered state of the circulating fluid. The delirium occasioned by the protracted use, and the sudden disuse, of narcotics or spirituous liquors, by erysipelas, and retrocedent exanthemata, is of this kind, between which and *delirium tremens* there is often a close resemblance.

12. *C. Delirium occasioned by inflammatory action of the brain or its membranes*, when the inflammation takes place primarily, is seldom attended by very manifest exhaustion of vital power, at least to the extent of the preceding forms. When, however, the inflammatory action is very general throughout the brain or its membranes, or when it supervenes on continued fevers or erysipelas, and is attended with serous effusion, vital depression is more apparent, and its termination in, or alternation with, coma, more common. This state of delirium, particularly when it proceeds from concussion or external injuries, is often phrenitic or maniacal — the *Delirium ferox* of authors — as respects the exaltation of muscular force. It is occasioned by all the causes stated to produce inflammation of the brain, particularly suppression of critical or accustomed evacuations, eruptions, or discharges; anger; the exciting passions; metastasis of specific inflammations; the ingestion of spirituous liquors, &c. Whilst the protracted use of intoxicating beverages, &c. occasions delirium tremens, unaccustomed intoxication sometimes produces the

delirium now being noticed, by inflaming the brain. This form of the affection is often complicated with convulsions, contractions of the limbs, paralysis, &c., particularly when the substance of the brain is organically changed; and is, when thus attended, very much more dangerous. (See BRAIN — *Inflammations of*, § 164.)

13. iv. LESIONS OBSERVED IN FATAL CASES. — In the *first* form of this affection, scarcely any, or no evident change, is found in the brain or its membranes, beyond either a somewhat increased or diminished vascularity, occasionally with a slight increase of the consistence of the cerebral substance, or of the fluid in the ventricles. In many cases, all the parts within the cranium are apparently sound. In the *second* variety, and wherever delirium is unattended by marked disorder of the muscular actions — when it is without extreme prostration, or convulsions, or paralysis — the chief changes are, increase of the consistence of the brain, and of the fluid contained in the ventricles, injection of the pia mater, sometimes with infiltration of serosity, and occasionally a somewhat deeper shade of colour in parts or the whole of the cerebral substance. M. GEORGET remarks that pathological investigations do not confirm the opinions of some authors, who impute the cause of delirium and convulsions to inflammation of the arachnoid; and that even epileptics and the insane seldom present the appearances usually caused by arachnitis. They have probably confounded inflammation of the membranes and periphery of the brain with the usual manifestations of delirium; and thus imputed the changes observed in the former, to the latter. In the *third* form of this affection, or when it is attended by the lesions of muscular action noticed above, the appearances observed are more completely those usually found after inflammation. Indeed, delirium frequently occurs, but not uniformly, or even generally, in nearly all the inflammatory diseases of the brain or of its membranes, and occasionally in the advanced stages of the organic changes limited to parts of this organ. (See art. BRAIN.)

14. v. PROGNOSIS. — The great diversity of the results furnished by *post mortem* investigations will show the difficulty of appreciating aright the conditions of the brain in delirium, and of coming to a correct conclusion as to its issue. When it is sympathetic of disease of remote organs, the worst opinion should be formed of the result. Delirium occurring in the advanced stages of diseases of the lungs, stomach, or bowels, is a most dangerous symptom; and when it supervenes in slow and consumptive maladies, it rarely remits, and death is not far distant. It seldom appears as a sympathetic affection, until the powers of life are greatly depressed, and the pulse is very much increased in frequency and diminished in tone. Dr. GILBERT (*Krankheiten der Französ. Arm.* p. 48.) observes, that delirium prevailed in the fevers which accompanied the French wars in Germany, in proportion to the frequency and weakness of the pulse, — a fact fully supporting the inference at which I had long ago arrived. On the other hand, when it appears in an intermittent or slight form, or from the operation of the less intense causes upon delicate and nervous constitutions, and without other grave symptoms, although evincing the severity of affection, it is not, in itself, a dangerous occurrence. When it follows capital operations, or severe injuries of any kind, it very often indicates the developement of inflammatory action of the brain of a most dangerous or rapidly fatal form. Delirium is most frequent in females, in the nervous temperament, and in young persons above the age of eight or ten years; but it is, in such cases, a less unfavourable symptom. It is seldom observed previously to the fourth or fifth year, — convulsions usurping its place at an earlier age: but, when it occurs thus early in life, it is a sign of great febrile excitement, with either determination to, or acute inflammation of, the membranes or periphery of the brain. If it be continued, or alternate with coma; or if it be *complicated*, with extreme prostration of muscular power, or with convulsions, spastic contractions, paralysis; the existence of inflammation of the brain, to the extent of producing organic change and extreme danger, may be inferred. PERERIUS, PISO, and many other writers, have contended that furious and sad or fretful delirium is more unfavourable than that which is tranquil or lively; and the observation seems to be nearly correct. The prognosis of sympathetic delirium should, however, not be founded so much upon its form, and the other symptoms referrible to the cerebro-spinal system, as upon the nature of the primary malady; for it is not the delirium which is in itself dangerous, but the disease upon which it supervenes; the circumstance of its occurrence evincing the very sinking condition of vital power. M. GEORGET truly states, that the sudden cessation of delirium and agitation, attended by want of recollection of the previous state, by great debility, irregularity of the action of the heart, and loss of temperature in the extremities, nose, and ears, is a most unfavourable omen; and often accompanies the termination, by gangrene, of inflammation of some important organ, always indicating approaching dissolution. When delirium accompanies fevers, particularly those with determination of blood to the encephalon, or inflammations of the brain or of its membranes, it often yields favourably to epistaxis, copious alvine discharges, and other critical evacuations. (See art. CRISES.)

15. vi. TREATMENT. — When the inexperienced practitioner, in his endeavours to obtain information as to the treatment of this affection, finds remedies of the most opposite kind very confidently recommended by writers, — venæsection by one, bark and stimulants by another, emetics or purgatives by a third, and digitalis, antimonials, &c. by a fourth, — he is at a loss how to act; and arrives at the conclusion, that if one be right, the others must necessarily be wrong. The fact, however, is, that all of them are partly right, but also partly wrong. The circumstance of this affection having been hitherto viewed without reference to the very different states or grades of vital energy with which it is often associated, or to the condition of circulation in the brain, and its division into idiopathic and symptomatic, — either of these divisions presenting the different forms I have endeavoured to distinguish, — has led to, and perpetuated, the empirical manner in which it has been treated. It is necessary to ascertain not only the origin and morbid relations of this affection, but the

phenomena attendant upon it at the time of investigation; more especially the condition of the secretions and excretions, the temperature of the head, the state of the pulse in the carotids and temples, the appearance of the countenance, and the state of muscular power and motion. These will at once indicate to the observing practitioner the existing pathological condition causing the affection, — will enable him to assign it to one or other of the forms above distinguished, and thereby to prescribe for it appropriate remedies.

16. *A.* The *first* form of this affection (§ 10.) will be most benefited by quietude, gentle restoratives, and nourishment; by a moderately cool, pure, and frequently renewed air; by the tepid affusion on, or cooling applications to, the head, if there be any increase of its temperature; by warm pediluvia; by camphor conjoined with refrigerants and cardiacs, or with sedatives; and, if the vital depression be very great, the head cool, and the carotids pulsating weakly, by the preparations of quinine or bark, of assafœtida, valerian, musk, camphor in large doses, with those of ammonia, opium, &c., exhibited by the mouth, and in clysters: or by small quantities of mulled wine or negus. In the more purely *nervous delirium*, or when it occurs from operations, anxiety, fear, and injuries of parts at a distance from the head, opium, given by the mouth, or in enemata, as recommended by M. Dupuytren, will be most beneficial. If it be attended by much agitation, narcotics — as opium or hyoscyamus — in full doses, either alone, or with camphor, assafœtida, soda, or ammonia, &c.; the acetate or muriate of morphine, with aromatics and cardiacs; quietude, in a cool, well-ventilated, and darkened apartment; the tepid affusion on, or cold-sponging, the head, if its temperature be increased; and warmth to the lower extremities; are the chief remedies.

17. *B.* In the *second form* of this affection (§ 11.), if there exist signs of determination of blood to, or of congestion in, the head, bleeding by cupping, or leeches applied behind the ears and below the occiput, the affusion of a stream of cold water on the vertex, and purging, are amongst the most efficient means that can be employed. If the delirium be attended by stupor, or tendency to *coma*, or by *subsultus tendinum*, picking of the bed-clothes, &c., blisters to the nape of the neck, and the treatment advised in the article Coma, will be requisite. If the delirious stupor be not removed by the more usual remedies, and if it have arisen from erysipelas of the head, incisions of the scalp of the occiput, as recommended by Copland Hutchison, may be practised. When there is no very considerable heat of the head, or when the extremities are cool, and the morbid secretions have been purged off, full doses of camphor (F. 494. 496. 903. 906.) may be exhibited. If the pulse be very weak, and the prostration of strength very great, the preparations of quinine or of bark, or of ammonia, camphor, assafœtida, valerian, musk, &c., with aromatics and cardiacs, or even wine in the form of negus, should be resorted to. When, with the vital depression and increased vascular action characterising this form of delirium, there are appearances of a morbid state of the circulating fluid, we should endeavour to rouse the vital energies at the same time that we excite the secreting and depurating organs, by exhibiting camphor with the chlorates (the oxymuriates) of the alkalies (see F. 439. 845. 847. 928.), and the resinous purgatives with bitter tonics and stimulants (F. 492. 504. 572.). In such cases, the treatment recommended in the articles Blood (§ 156, *et seq.*), and Fever, will also be appropriate. As soon as stupor and a tendency to coma appear, in addition to the medicines now suggested, cathartic and stimulant enemata (F. 139. 149.), or an active purgative draught (F. 216.), should be exhibited, and repeated according to circumstances; and if these fail, blisters, sinapisms, rubefacient cataplasms or liniments, may be resorted to. The terebinthinates have been employed by me since 1819, with great benefit, in this and some other forms of febrile delirium. The practice has lately been favourably noticed by Dr. Graves (*Med. and Surg. Journ.* vol. ii. p. 782.). If the head be cool, and the pulse, particularly in the carotids, be weak, small, and very frequent, either in this or the preceding form, all revulsants from the head, even the keeping it elevated, or warm pediluvia, will be injurious; and may convert, as Dr. E. Gilchrist (*Edin. Med. Essays and Observ.* vol. iv. p. 358, *et seq.*) long ago remarked, a tranquil, into a most violent, delirium, which may soon terminate in fatal exhaustion. In both the *first* and *second* forms of this affection, the practitioner should not be induced to resort to lowering measures, merely because the muscular force is momentarily increased, and the patient is violent, restless, and agitated. If, with this state, the pulse is very frequent, small, weak, or irregular, and the head not very hot, a restorative and soothing treatment will be more beneficial. I have repeatedly observed, that this form of the affection, when supervening on protracted and exhausting disease, has been almost immediately subdued by small quantities of warm spiced negus; by camphor, with capsicum and opium or hyoscyamus; and by frequently sponging the head with cold or tepid water, when its temperature has been increased, or by the tepid affusion.

18. *C.* The *third* or inflammatory form of delirium should be treated in every respect as described when discussing inflammation of the brain or its membranes. (See art. Brain.) General and local bleedings, cold affusions and applications to the head, &c., are indispensable in it. If the delirium be *complicated* with stupor, or coma, convulsions, contractions or paralysis of muscles, &c., vascular depletions and active alvine evacuations should be followed by external derivatives of a permanent kind; by incisions of the scalp; by issues, open blisters, moxas, the use of the tartar emetic ointment, dry-cupping, &c.; whilst the secretions, &c. should be promoted by mercurial and other alteratives, and the bowels fully evacuated from time to time by a cathartic draught (F. 216.), and enema (F. 149.). In every form of the affection, the patient should be irritated as little as possible by opposition, but indulged as much as is consistent with safety.

19. *D.* I shall conclude by noticing the *treatment recommended by some authors.* — (*a*) The topical application of *cold* has been advised by every writer on this affection, particularly since Bartholinus so strenuously recommended it

(*De Usu Nivis Medico*, cap. 25.). It may be prescribed in the form of cold affusion, pounded ice, cold epithems, evaporating lotions on the head, or simple sponging. If, however, it be continued too long, or after the morbid heat has been subdued, and the features have shrunk, it will be injurious, by depressing the nervous energies too low, and favouring the supervention of coma, or violent agitations, terminating in fatal exhaustion. It is required chiefly in the *third* form of the disease; but in the *first* and *second* forms, when the temperature of the head is increased, it should be cautiously employed, or the tepid affusion substituted for it. In these, however, I have preferred that the scalp should be sponged with a tepid and very weak solution of the nitro-muriatic acid. — (*b*) *Camphor* has been nearly as universally prescribed. Büchner (*De Præstantia Camphoræ in Deliriis.* Halæ, 1763.), and Tode (in *Soc. Med. Hann. Coll.* ii. No. 34.) especially recommended it, — the latter with mineral acids. It is a most excellent remedy when judiciously exhibited. If given at all in the *third* form of the affection, it should be in small doses, with nitre and antimony, or with digitalis. In the *first* form, it may be prescribed in larger quantity; and in the *second*, especially if there be stupor or coma, or a morbid state of the blood, in still larger doses, with tonics, antiseptics, aromatics, and cordials. — (*c*) *Opium* or *hyoscyamus* is noticed by Percival (*Lond. Med. and Phys. Journ.* vol. i. p. 443.), Goubier (*Journ. de Méd.* t. lxxxv. p. 244.), Dupuytren, and Kortum (*Beyträge zur Pract. Arzneywiss.* No. 9.). In some states of the *first* and *second* forms of the affection, when it is purely nervous, or is attended by much agitation, watchfulness, &c., either of these medicines may be employed. In the more doubtful cases, either of them may be safely exhibited with camphor and James's powder. In the *third* form, particularly when it assumes a *maniacal* or violent character, and after depletions have been carried as far as may be thought prudent, and the bowels have been freely evacuated, I have repeatedly seen a full dose of opium or hyoscyamus, given either alone, or with antimony, or James's powder, and camphor, produce the happiest effect. Any unpleasant symptom that may result either from too large doses of these narcotics, or from their inappropriate use, will readily be removed by the cold or tepid affusion on the head. The acetate or muriate of morphine, taken in a full dose of the spirits of pimenta, or in any other aromatic spirit, has proved equally beneficial with opium, in my practice. The *external* employment of opium has been found very successful in delirium, by V. Chiarurgi (*Sull' Uso Esterno dell' Opio*, 8vo. Flor. 1797.), Ward (*Lond. Med. and Phys. Journ.* vol. i. p. 441.), and Percival (*Ibid.* p. 444.), who have used it in the form of liniment (ʒj. triturated with ℥j. of adip. præp.), either with or without camphor. — (*d*) *Purgatives* have been justly praised by all writers on this affection. The ancients prescribed them in very large doses, and preferred the hellebores, which, with calomel and those I have already particularised, should be actively exhibited, according to the strength of the patient. When the debility is great, they must be associated with a tonic and stimulant treatment. — (*e*) *Emetics* have been mentioned by several writers; and when delirium proceeds from the ingestion of narcotic, indigestible, irritating, or poisonous substances, or is connected with the accumulation of saburræ in the upper portions of the digestive tube, they are then requisite. — (*f*) *Antispasmodics* and *cordials*, particularly valerian (Warburg, *Med. Beobacht.* No. 16.), assafœtida (Wanters, *Journ. de Méd.* t. lvi. p. 115.), musk (Kortum, *loc. cit.*), warm negus, and similar medicines, have been recommended; and are often of service, when the powers of life are much depressed. — (*g*) *Blisters* have been applied to the head much too indiscriminately: I have seen them prove most injurious in this situation. Dr. E. Gilchrist, one of the best writers of his time, directs them both to the head and to the insides of the legs. I believe that they will prove beneficial in the former situation, only when the powers of life are sinking fast, and the delirium is attended by stupor, a cool head, and sunk or collapsed features, as in cases of low or adynamic fevers. When this affection is consequent upon febrile determination of blood to the head, blisters on the insides of the legs, &c. may be useful derivatives; but they often occasion so much pain and irritation in this situation, as to thereby counteract, particularly in the turbulent state of delirium, any good they might otherwise produce. — (*h*) Of the *sedatives* or *contra-stimulants* prescribed by writers, the preparations of antimony, particularly James's powder—digitalis, and the nitrate of potash, are the most deserving of notice. Wherever the delirium is connected with increased vascular action in, or determination to, the head, these medicines are of more or less service when judiciously combined with other appropriate remedies. Withering (*On Digitalis*, p. 33.) and Patterson (*Med. and Phys. Journ.* vol. v. p. 442.), strenuously advise the preparations of digitalis; but they, as well as those of antimony, require much caution, if ventured upon in the delirium attendant on low or malignant fevers. It is chiefly in the maniacal or *third* form of this affection that they are most beneficial, and in it they should be exhibited in a decided manner; but in the *first* and *second*, particularly in the delirium of typhus, they are generally injurious. — (*i*) The *actual cautery* on the nape of the neck, and *moxas*, have been advised by M. Valentin (*Med. and Phys. Journ.* vol. xix. p. 432.), and several other Continental writers. — (*k*) Dr. Grant (*On Fevers*, 8vo. 1771.) recommends the patient to be allowed to dress and sit up when he feels anxious to do so; but this, and several judicious observations of this writer, are more fully adverted to in the article on Fever. The observations made on convalescence from *Inflammations of the* Brain, and from Fever, are perfectly applicable to the management of convalescence from delirium. (See these articles.)

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